Onan

MAJOR SERVICE MANUAL

FOR SERIES

AT

AUTOMATIC TRANSFER SWITCHES

30 THROUGH 400 AMPERES

FOR DISTRIBUTOR, DEALER AND INTERNAL USE ONLY

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SAFETY PRECAUTIONS

This manual includes the following symbols to indicate potentially dangerous conditions to the operator or equipment. Read the manual carefully and know when these conditions exist. Then take the necessary steps to protect personnel and the equipment.

WARNING **Onan uses this symbol throughout this manual to warn of possible serious personal injury.**

CAUTION **This symbol refers to possible equipment damage.**

The automatic transfer switch has components with high voltages which present serious shock hazards. For this reason, read the following suggestions.

Keep the automatic transfer switch cabinet closed and locked. Make sure authorized personnel only have the cabinet keys.

Always move the operation selector switch on the generator set or automatic transfer switch to "STOP" disconnect the starting batteries of the generator set and remove AC line power to the automatic transfer switch before performing maintenance or adjustments (unless specified otherwise in the instructions—then only using extreme caution due to danger of shock hazard).

Before using the disconnect plug (if equipped, for deenergizing the control panel), be sure to place the operation selector switch on the generator set or automatic transfer to the "STOP" position. Neglect of this procedure results in set starting and energization of the transfer switch generator side.

Use rubber insulative mats placed on dry wood platforms over floors which are metal or concrete when working on any electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling any electrical equipment.

Jewelry is a good conductor of electricity and should be removed when working on the electrical equipment.

Do not work on this equipment when mentally or physically fatigued.

WARNING

TO AVOID POSSIBLE PERSONAL INJURY OR EQUIPMENT DAMAGE, A QUALIFIED ELECTRICIAN OR AN AUTHORIZED SERVICE REPRESENTATIVE MUST PERFORM INSTALLATION AND ALL SERVICE.

TABLE OF CONTENTS

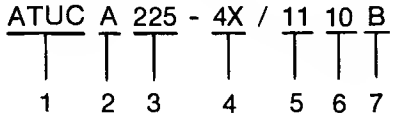
GENERAL INFORMATION

ONAN SERVICE MANUAL

This manual contains a detailed operation description, adjustments, repair, troubleshooting information and wiring diagrams of all 30 through 400 ampere automatic transfer switches. Whenever troubleshooting or planning a repair, remember the electric generating set, automatic transfer switch and commercial source are all interdependent. Take all the necessary and normal safety precautions and then decide whether the automatic transfer switch, generating set or commercial power source is the source of problems. A troubleshooting section is included in this manual.

MODEL NUMBER SYSTEM

Following is a typical model number with explanations of the different parts.



1. Series Identification

ATUC - two-wire start, 24 volts.
ATUD - two-wire start, 12 volts.
ATUE - three-wire start, 12 volts.

"U" indicates UL listing.

2. Transfer Switch and Cabinet Combination Code.

3. Current Rating (amperes).

4. Voltage Code

1 - 120 volts, single phase, 60 Hz.
2 - 240 volts, single phase, 60 Hz.
3 - 120/240 volts, single phase, three wire, 60 Hz.
4 - 120/208 volts, three phase, four wire, 60 Hz.
4X - 277/480 volts, three phase, four wire, 60 Hz.
5D - 120/240 volts, three phase, four wire, delta, 60 Hz.
9X - 347/600 volts, three phase, four wire, 60 Hz.

For 50-hertz operation, number "5" prefix is used. . .example is 54X.

5. Control Accessory Group

Groups 11 Through 15*

Accessory	Group				
	11	12	13	14	15
Start-Stop Time Delay	X	X	X	X	P
Transfer Time Delay	P	P	P	X	P
Retransfer Time Delay	W	X	X	X	P
Battery Charger Module	X	X	X	X	P
Battery Voltage Sensor	W	W	W	X	P
Undervoltage Sensor (all lines)	X	X	X	X	X
Overvoltage Sensor (line)	W	W	W	X	P
Exerciser Clock	W	X	X	X	W
Manual Retransfer Switch	W	W	X	W	X
Preheat Time Delay	W	W	W	W	P

X = Supplied standard.
P = Plug-in module package available.
W = Wire-in package available.

* - Include 2-amp charger, normal-test switch, with load—without load selector switch, disconnect plug, area protection terminals, cranking limiter on AT-E only, and engine start-run signal.

Groups 51 Through 55*

Accessory	Group				
	51	52	53	54	55
Preheat Time Delay	W	W	W	W	W
Start Time Delay	W	W	W	X	X
Transfer Time Delay	W	W	W	W	X
Retransfer Time Delay	W	X	X	X	X
Stop Time Delay	W	W	W	W	X
Exerciser Clock	W	W	X	X	X

X = Supplied standard.
W = Wire-in package available.

* - Include voltage sensing relays, normal-test switch, disconnect plug, area protection terminals, cranking limiter on AT-E only and engine start-run contacts.

6. Meter-Lamp Combination

Accessory	Group															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Charge Ammeter	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Overcrank Lamp (AT-E only)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Normal-Emergency Lamps	W	X	W	X	W	X	W	X	W	X	W	X	W	X	W	X
Battery Voltage Lamps	W	W	X	X	W	W	X	X	W	W	X	X	W	W	X	X
AC Voltmeter					X	X	X	X								
Full Meter Panel*									X	X	X	X				
Running Time Meter													X	X	X	X

X = Supplied standard.
W = Wire-in package available.

* - Includes voltmeter, ammeter(s), running time meter, frequency meter and current transformer.

7. Specification Letter

Advances with production modification.

Throughout the text, front of the automatic transfer switch is the door side. Left and right are determined when facing the cabinet doors. Metric equivalent of U.S. customary unit is given in parentheses where applicable.

OPERATION DESCRIPTION

This detailed operation description is intended as an aid in understanding and servicing the automatic transfer switch. For a simple explanation of the automatic transfer switch's functions and descriptions of various components, see the operator's manual.

Two operation descriptions are given, one for automatic transfer switches with relay-type control accessory panels (see *AT's WITH CONTROL PANEL GROUPS 51 THROUGH 55*), and one for those with modular-type control accessory panels (see *AT's WITH CONTROL PANEL GROUPS 11 THROUGH 15*). Follow the appropriate description. Individual accessory items are discussed after the basic operation description of each type control accessory panel.

The schematic wiring diagrams for the automatic transfer switches are divided into three groups: meter-lamp panel, control accessory panel, and transfer switch cabinet. Each diagram is also divided into three parts: a pictorial wiring diagram, a schematic and a parts list.

Wiring diagrams referenced in the operation description are shown at the end of this section. Operation description covers begin Spec B automatic transfer switches.

If you wish to follow the schematic diagrams as operation is described, note that you have to use and follow all three schematic diagrams. Numbers of the wiring diagrams will be noted in the description.

The operation description is for an automatic transfer switch with a mechanically held transfer switch on line side only. Mechanically held transfer switches on both line and generator side operate much the same.

AT'S WITH CONTROL ACCESSORY PANEL GROUPS 11 THROUGH 15

NORMAL OPERATION

Under normal conditions the commercial line supplies the power to the load through the closed K1 contacts—lines A, B and C shown in the schematic diagram 626C0106. The closing coil CC of transfer switch K1 is originally energized from terminal A on the line side through: the closing coil CC, normally closed K1 contact CS, normally closed K2 contact IC, terminal W of receptacle J1. Terminal J1-W connects to terminal W of disconnect plug P1 (drawing 626D0138) which connects to normally closed K4 contact (3-9) and back to Y terminal of disconnect plug P1. P1-Y connects to terminal Y of receptacle J1 (drawing 626C0106). J1-Y connects to line B on the line side of transfer switch K1. Once a mechanically-held transfer switch on line side is picked up by the commercial line, it is mechanically held in that position until the trip coil is energized.

Battery Charging

The transfer switch line side K1 terminals A and B feed J1 receptacle terminals X and Y (drawing 626C0106) and P1 plug terminals X and Y (drawing 626D0138) to energize transformer T1 through fuse F1. Transformer T1 has three secondary terminals X1, X2 and X3. Terminals X1 and X2 supply approximately 20 volts output for 12-volt battery charging. Terminals X1 and X3 supply approximately 40 volts output for 24-volt battery charging.

For 12-volt battery charging, transformer terminal T1-X2 connects to resistor R1-2. Resistor terminal R1-1 connects to terminal 21 of battery charger plug-in module 6. Transformer terminal T1-X1 connects to terminal 15 of battery charger plug-in module 6. The battery charger module rectifies and regulates the DC output voltage to float-charge the cranking battery.

Positive output terminal 1 on module 6 supplies charging current through TB6-2 (drawing 626C0106), TB7-2 (drawing 626C0164) through the ammeter M11, TB7-1 (drawing 626C0106), TB6-1 (drawing 626D0138) to the B+ terminal on TB1 which connects to the positive terminal of the battery. Terminal 4 of plug-in module 6 connects to the ground terminal which in turn connects to the negative terminal of the battery. This battery charging module 6 has a rated output of 2 amperes maximum and is voltage regulated to float the battery continuously without damage to the battery.

POWER OUTAGE

When a power outage occurs (commercial power source), primary voltage to transformer T2 supplied from lines A and B, through terminals X and Y of the disconnect plug (drawing 626C0106), disappears. Voltage at terminals T2-X1 and T2-X2 goes to zero (drawing 626D0138). With zero input voltage to voltage sensor module 1, contacts 8-10 open to deenergize line interposing relay K3. Relay contacts K3 (2-8) close, K3 (1-7) close, and K3 (6-9) open. Contacts K3 (1-7) close the circuit to terminal 9 of start-stop time delay module 7. After an adjustable time delay, the start-stop time delay module 7 closes the circuit between terminals 12 and 22 to apply battery voltage to the remote terminal (RMT).

Two-Wire Starting

The battery positive on the remote terminal (RMT) signals the generator set to start.

Three-Wire Start

The B+ on the remote terminal feeds terminal 10 on the 2 to 3 wire start converter plug-in module 9. With battery positive on terminal 10, the 2 to 3 wire converter closes the circuit between terminals 15 and 4 grounding output terminal 3. The generator set starts and runs.

The generator output voltage to transfer switch K2 (drawing 626C0106) terminals A and B through TB7-6 and -7, TB6-6 and -7 (drawing 626D0138) energizes the primary of stepdown transformer T3. Transformer T3 terminals X1 and X2 feed a nominal 40 volts into voltage sensor module 4 terminals 12 and 15. When this output voltage exceeds the set point of the voltage sensor module 4, the solid state switch (8-10) closes the circuit through module 8 (12-22), module 5 (16-18) to the battery positive line to energize generator interposing relay K4. The circuit from generator side terminal A through TB7-6 (drawing 626C0106), TB6-6 (drawing 626D0138) is closed through K4-4 and -7, K3-2 and -8, TB6-8, TB7-8 (drawing 626C0106), K1 mechanically-held closed contact, to energize K1 trip coil (K1-TC). The K1 trip coil operates to release the mechanically held mechanism and to close contact K1-IC. Contact K1-IC energizes the K2 closing coil from generator side terminal B to close the main K2 contacts connecting the load to the generator side.

The AC running time meter is energized whenever the generator set operates. Generator line A (drawing 626C0106) supplies power through TB7-6 (drawings 626C0106 and 626C0164), to running time meter M12-1. Generator line C (drawing 626C0106) supplies power through TB7-9 (drawings 626C0106 and 626C0164), to running time meter M12-2.

Momentary Power Outage

A very short duration power outage or dip on normal line voltage can drop line interposing relay K3 (drawing 626D0138). Contacts K3 (1-7) close to signal the start-stop time delay module 7 to start timing. However, if the voltage dip or power outage is shorter than the time delay and the start-up time of the generator set, normally closed contacts K4 (2-8) will bypass any time delay in retransfer to reenergize relay K3 through the voltage sensors to keep the load on the normal line. Contacts K3 (1-7) open to reset the start-stop time delay.

AREA PROTECTION

Onan automatic transfer switches have provisions for connecting area protection equipment. The normally closed output terminal of the area protection equipment connects to TB1-4 and -5 (see drawing 626D0138). A jumper between TB1-4 and -5 must be removed during wiring connections before the protection equipment will operate the circuit.

The area protection equipment opens the circuit between TB1-4 and -5 which removes the AC input voltage from voltage sensor module 1 (12-15). Voltage sensor module 1 opens the circuit through contacts (8-10) to drop line interposing relay K3.

Relay contacts K3 (1-7) close to energize start-stop time delay module 7. After the time delay period, module 7 contacts (12-22) close to connect B+ to the remote line (RMT) which signals the generator set to start.

Relay contacts K3 (6-9) open, K3 (2-8) close to prepare the transfer of the load from the line to the generator set. The generator voltage sensor module 4 contacts (8-10) close to energize relay K4. Contacts K4 (4-7) energize the K1 trip coil by completing the circuit from generator side line A (drawing 626C0106) through TB7-6, TB6-6 (drawing 626D0138), K4 (4-7), K3 (2-8), TB6-8, TB7-8 (drawing 626C0106), K1 mechanically held contact, K1 trip coil (TC) to generator side line B.

The K1 trip coil releases the mechanical latch K1 to open the power contacts. The load is removed from the line and contacts K1-IC close completing the circuit to energize K2 coil. K2 power contacts close to connect the load to the generator set.

When the area protection equipment closes the circuit between TB1-4 and -5 (drawing 626D0138) again, the voltage sensor module 1 closes a circuit through terminals 8 and 10 to pick up line interposing relay K3 again as described in *Restoration of Normal Line.*

RESTORATION OF NORMAL LINE

When the normal line power returns, it energizes stepdown transformer T2 (drawing 626D0138). Transformer T2 output voltage terminals X1 and X2 feed voltage sensor module 1 terminals 12 and 15 through area protection terminals TB1-4 and -5.

When the line voltage reaches normal, voltage sensor module 1 contacts (8-10) close to energize relay K3 through transfer bypass plug module 8 (1-6), module 5 (8-4), and switch contacts S1 (3-2). Normally closed contacts K3 (1-7) open to remove battery positive from start-stop time delay module 7 which initiates the time delay in stop. Also, contacts K3 (6-9) close the circuit from plug P1 terminal W, receptacle J1-W (drawing 626C0106), to transfer switch contacts K2-IC, transfer switch contacts K1-CS, through the K1-CC closing coil to terminal A on the line side. Transfer switch K2 contacts open and K1 contacts close to connect the load to the line.

The generator set continues to run until the start-stop time delay (drawing 626D0138) times out to open the circuit to module 7 contacts (12-22) to remove B+ from the remote (RMT) line. If the generator set is a 3-wire start, 2 to 3 wire converter module 9 removes ground from TB1 terminal 3 and puts ground on TB1 terminal 2 to stop the generator set.

SIMULATION OF POWER OUTAGE

To ensure that the equipment is ready to perform if an actual power outage occurs, the operator should periodically simulate a power outage to keep the fuel system filled and battery charged. The Onan automatic transfer switch has two switches to provide a choice of testing or exercising the generator set with load or without load.

Without Load

To test the generator set without load, place selector switch S2 in the "WITHOUT LOAD" (closed) position (drawing 626D0138). Then place the test transfer switch in the "TEST" position to complete the circuit from the battery positive terminal through S1 (1-2) and S2 (2-3) to the remote (RMT) line. This signals the generator set to start and run unloaded as long as the switch is in the "TEST" position. To stop the generator set, return the test switch to the "NORMAL" position.

With Load

To test the generator set under actual operating conditions, set selector switch S2 to the "WITH LOAD" position, then move the test transfer switch S1 from "NORMAL" position to "TEST" position. Relay contacts K3 (1-7) close to energize the start-stop time delay module 7. At the end of the time delay period, module 7 contacts (12-22) close to energize the remote terminal (RMT).

As the generator set comes up to speed, stepdown transformer T3 energizes undervoltage sensor module 4 to close circuit through contacts (8-10) and pick up generator interposing relay K4. Contacts K4 (4-7) close the circuit through K3 (2-8), TB6-8 (drawing 626C0106), TB7-8, K1 contact which is now being held closed by the mechanically held mechanism, trip coil K1-TC, and energizes K2 through the normally closed K1-IC transfer switch contacts. K1 contacts open to disconnect the load from the normal line and the K2 contacts close to connect the load to the generator side.

To end the test and retransfer the load back to the normal line, move the test switch S1 to "NORMAL" (drawing 626D0138). Line interposing relay K3 picks up through voltage sensor module 1 or sensor modules 1, 2 and 3. Relay contacts K3 (2-8) open, break the circuit through TB6-8 (drawing 626C0106) and TB7-8 to deenergize the K2 transfer switch coil. Relay contacts K3 (1-7) (drawing 626D0138) open to deenergize start-stop delay module 7 which initiates stopping. Relay contacts K3 (6-9) close the circuit through plug P1-W, receptacle J1-W (drawing 626C0106), K2-IC contacts and K1-CS contacts to energize the K1 closing coil. The K2 power contacts open to disconnect the generator from the load and K1 power contacts close to connect the load to the commercial power line. The mechanical latch on line side of the transfer switch locks the contacts closed and disconnects the K1 closing coil (CC). Start-stop time delay module 7 contacts (12-22) (drawing 626D0138) open after the time delay signaling the generator set to stop.

EXERCISER CLOCK

The exerciser clock starts and stops the generator set automatically for periodic test operations. Drawing 626D0145 shows the exerciser clock M1 motor circuit connected to stepdown transformer T1 terminals X4 and X5. Transformer T1 primary connects to the line side of the transfer switch through disconnect plug terminals X and Y.

The exerciser clock cam-operated switch contacts M1-3, -4 and -5 connect to test transfer switch S1 and selector switch S2. The M1 switch contacts are shown in the normal position with the contacts (3-5) open and contacts (4-5) closed. After the operator selects the mode, the exerciser clock automatically exercises the generator set.

Exercise Without Load

With switch S2 in the "WITHOUT LOAD" position, the exerciser clock closes contact M1 (3-5) to complete the circuit from B+ through switch contacts S1 (2-3), M1 (3-5), S2 (2-3) to the remote (RMT) terminal. The generator set starts and runs as previously described under *Test Without Load* until the exerciser clock contacts M1 (3-5) open at the end of the exercise period.

Exercise With Load

With selector switch S2 in the "WITH LOAD" position, exerciser clock contacts M1 (4-5) open the circuit to remove battery positive from line interposing relay K3. Relay K3 drops out the same as it does if there is a power outage and the generator set starts and runs as long as the exerciser clock contact remains open.

(drawing 626C0106) to line B. Transformer T11-X1 and -X2 supplies approximately 40 volts to light green normal lamp DS11.

When the standby generator set supplies power to the load, it energizes transformer T12 from generator side line A (drawing 626C0106) through TB7-6, TB6-6 (drawing 626D0145), contacts K4 (4-7), K3 (2-8), TB6-8 (drawing 626C0106), TB7-8 (drawing 626C0164), through T12 primary back through TB7-12 (drawing 626C0106), through K1-IC, to line B of generator. The secondary of T12 (drawing 626C0164) lights red emergency lamp DS12. Both lamps are 56-volt lamps operating on 40 volts.

TIME DELAY TRANSFER

The transfer time delay module 8 plugs into position 8 of the control accessory panel. The transfer time delay module delays the load pickup for an adjustable 0.5 to 10 seconds after the generator set starts. When the generator set starts, generator lines A and B (drawing 626C0106), through TB7-6 and -7, TB6-6 and -7, energize stepdown transformer T3 (drawing 626D0145) which supplies a nominal 40 volts to voltage sensor module 4 (12-15). Voltage sensor module 4 contacts (8-10) close the circuit through generator interposing relay K4 coil to terminal 12 of transfer time delay module 8. Battery positive voltage feeds through terminals 18 and 16 of the voltage regulator module 5 to module 8 terminal 22. Module 8 delays closing of solid state switch A8 (12-22) to energize relay K4. Relay contacts K4 (4-7) close the circuit through relay contacts K3 (2-8), TB6-8 (drawing 626C0106), TB7-8, K2 closing coil and contacts K1-IC to energize the K2 coil for transfer of the load to the generator side.

BATTERY VOLTAGE SENSOR

The battery voltage sensor, available in 12-volt or 24-volt versions, is a plug-in module with two relays mounted on the printed circuit board. The battery voltage sensor module 10 monitors the battery charging system. If the battery charger is exceeding a safe float voltage, it lights the high battery voltage lamp DS14. If the battery float charger fails to charge, the sensor lights the battery low voltage lamp DS13.

Drawing 626D0145 shows the ground lead connecting to module 10 terminal 12. The battery positive line connects to module 10 terminal 19. If the battery charger is exceeding the high battery voltage sensor setting, the sensor lights the high battery voltage lamp DS14 through a circuit from module 10 contact 21, TB6-3 (626C0106), TB7-3 (626C0164), DS14, TB7-5 (drawing 626C0106), TB6-5 to ground. Contacts connected to TB2 terminals 1 and 2 close (drawing 626D0145). Contacts connected to TB2 terminals 2 and 3 open. If the battery charger has failed to charge, the battery voltage will drop below the battery voltage sensor setting and it lights the low battery voltage lamp DS13, through a circuit from module 10 contact 17, TB6-4 (drawing 626C0106), TB7-4 (drawing 626C0164), DS13, TB7-5 (drawing 626C0106), and TB6-5 to ground. The battery voltage sensor closes the contacts connected to TB2 terminals 4 and 5 (drawing 626D0145) and opens the contacts connected to TB2 terminals 5 and 6 to indicate a low battery voltage condition.

AC OVERVOLTAGE SENSOR

Overvoltage sensors monitor the commercial line and start the generator set in case the commercial line exceeds the set voltage. Drawing 626D0145 shows three voltage sensor modules 13, 14 and 15 monitoring a three-phase system. The solid state switches of all three voltage sensors connect in parallel so that if any one line voltage exceeds the voltage setting, the voltage sensor will close its circuit between terminals (8-10) to energize overvoltage relay K6. Contacts K6 (1-7) open to drop relay K3. Contacts K3 (1-7) close to energize the start-stop time delay module 7. Time delay module 7 contacts (12-22) close to energize the remote line (RMT) and start the generator set. When the generator set comes up to speed and voltage, relay K4 closes contacts K4 (4-7) to energize the transfer switch through contacts K3 (2-8), TB6-8 (drawing 626C0106), TB7-8, relay coil K2, contact K1-IC to generator line B to transfer the load from line to the generator set. See *Power Outage*.

When the commercial line voltage returns to normal, the voltage sensor opens the circuit between terminals (8-10) to drop relay K6 (drawing 626D0145). Contacts K6 (1-7) close again to allow relay K3 to be energized through plug-in module 8 and the undervoltage sensors. See *Restoration of Normal Line*.

AUXILIARY CONTACTS ON LINE SIDE AND GENERATOR SIDE

Small switches mounted on the transfer switch, actuated by the moving armature, provide dry contacts to indicate transfer switch position. Diagram 626C0106 shows the K1 auxiliary contacts connecting to TB9 terminals 1, 2 and 3. The normally open contact connects to terminals 1 and 2 and the normally closed contact connects to terminals 2 and 3. The K2 auxiliary contacts S6 have a normally open contact connecting to terminal block TB9 terminals 4 and 5 and a normally closed contact connecting to terminals 5 and 6.

AT'S WITH CONTROL PANEL GROUPS 51 THROUGH 55

NORMAL OPERATION

Under normal conditions, the commercial line supplies power to the load through the closed K1 contacts—lines A, B, and C shown in schematic 626C0106. The closing coil CC of transfer switch K1 is originally energized from terminal A on the line side through: the closing coil CC, normally closed K1 contact CS, normally closed K2 contacts IC, terminal W of receptacle J1. Terminal J1-W connects to terminal W of disconnect plug P1 (drawing 626C0071) which connects to normally open K3 contacts (6-5) and back to Y terminal of disconnect plug P1. P1-Y connects to terminal Y of receptacle J1 (drawing 626C0106) which connects to line B on the line side of transfer switch K1. Once a mechanically-held transfer switch on line side is picked up by the commercial line, it is mechanically held in that position until the trip coil is energized.

POWER OUTAGE

When a power outage occurs (normal line), voltage from lines B and C (drawing 626C0106), through disconnect plug terminals Y and Z disappears (drawing 626C0071). Relay K6 is deenergized and contacts K6 (3-5) open. Relay K3 is deenergized, contacts K3 (5-6) open and contacts K3 (1-3) close.

Two-Wire Starting

Relay K7 is deenergized, contacts K7 (1-5) close to connect battery positive voltage from TB1-B+ to the remote start terminal (TB1-RMT). The generator set starts and runs.

Three-Wire Starting

Relay K7 is deenergized (drawing 626C0171), contacts K7 (3-5) open and contacts K7 (1-5) close to connect battery ground from TB1-1, through selector switch S2, M1 (4-5), K7 (1-5), K4 (1-2), K5 (1-2), TB1-H, and to TB1-3. The generator set starts and runs.

Generator output voltage from generator line B (drawing 626C0106), completes a circuit through TB7-7, TB6-7 (drawing 626C0071), resistor R4, relay K4, TB6-12, TB6-11, TB6-6, TB7-6 (drawing 626C0106), and to generator line A. Relay K4 is energized and contacts K4 (3-4) close. Transfer switch tripping coil K1-TC is energized from generator line B (drawing 626C0106), through normally-open K1 contacts, TB7-8, TB6-8 (drawing 626C0071), contacts K3 (1-3), K13 (5-L3), closed K4 contacts (3-4), TB6-6, TB7-6 (drawing 626C0106), to generator line A. The K1 trip coil operates to release the mechanically held mechanism and to close contacts K1-IC. Contacts K1-IC complete the circuit to energize the K2 closing coil from generator side terminal B. Coil K2 then closes the main K2 contacts connecting the load to the generator side.

AREA PROTECTION

Onan automatic transfer switches have provisions for connecting area protection equipment. The normally-closed output terminal of the area protection equipment connects to terminals TB1-4 and -5 (see drawing 626C0071). A jumper between these two terminals must be removed before the protection equipment will operate the circuit.

The area protection equipment opens the circuit between TB1-4 and -5 which removes AC input voltage from relays K3 and K7. Relay K3 is deenergized, contacts K3 (5-6) open and contacts K3 (1-3) close.

Two-Wire Starting

Relay K7 is deenergized, contacts K7 (1-5) close to connect battery positive voltage from TB1-B+ to the remote start terminal (TB1-RMT). The generator set starts and runs.

Three-Wire Starting

Relay K7 is deenergized (drawing 626C0171). Contacts K7 (3-5) open and contacts K7 (1-5) close to connect battery ground from TB1-1, through selector switch S2, M1 (4-5), K7 (1-5), K4 (1-2), K5 (1-2), TB1-H, and to TB1-3. The generator set starts and runs.

Generator output voltage from generator line B (drawing 626C0106), completes a circuit through TB7-7, TB6-7 (drawing 626C0071), resistor R4, relay K4, TB6-12, TB6-11, TB6-6, TB7-6 (drawing 626C0106), and to generator line A. Relay K4 is energized and contacts K4 (3-4) close. Transfer switch tripping coil K1-TC is energized from generator line B (drawing 626C0106), through normally-open K1 contacts, TB7-8, TB6-8 (drawing 626C0071), contacts K3 (1-3), K-13 (5-L3), closed K4 contacts (3-4), TB6-6, TB7-6 (drawing 626C0106), to generator line A. The K1 trip coil operates to release the mechanically-held mechanism and to close contacts K1-IC. Contacts K1-IC energize the K2 closing coil from generator side terminal B to close the main K2 contacts connecting the load to the generator side.

When area protection equipment closes the circuit between TB1-4 and -5, relay K3 is energized as described under *Restoration of Normal Line*.

RESTORATION OF NORMAL LINE

When the normal line returns, a circuit is complete from normal line B, to terminal Y of receptacle J1 (drawing 626C0106), disconnect plug terminal P1-Y (drawing 626C0071), relay K6, terminal P1-Z, receptacle terminal J1-Z (drawing 626C0106) and to normal line C. Relay K6 is energized and closes contacts K6 (3-5) (drawing 626C0071).

A circuit is now complete from the disconnect plug terminal P1-Y through test transfer switch S1 (2-1), TB1-4 and -5, K6 contacts (3-5), K10 (7-8) and K9 (7-8), relays K3 and K7, disconnect plug terminal P1-X, terminal J1-X (drawing 626C0106) and to normal line A. Relay K3 is energized (drawing 626C0071), opens contacts K3 (1-3) and closes contacts K3 (5-6). Open contacts K3 (1-3) break the circuit to TB6-8 and to TB7-8 (drawing 626C0106) to deenergize the K2 closing coil. Power from normal line B (drawing 626C0106) completes a circuit through receptacle terminal J1-Y, plug terminal P1-Y (drawing 626C0071), closed contacts K3 (5-6), disconnect plug terminal P1-W, receptacle terminal J1-W (drawing 626C0106), closed contacts K2-IC, K1-CS, closing coil K1-CC, to normal line A. Transfer switch contacts K2 open to remove the generator from the load and K1 contacts close to connect the load to the commercial power line.

Two-Wire Stopping

Relay K7 is energized and opens contacts K7 (1-5) to remove battery positive (B+) from the remote (RMT) terminal and stop the generator set. See drawing 626C0071.

Three-Wire Stopping

Relay K7 is energized, opens contacts K7 (1-5) and closes contacts K7 (3-5) to place battery ground on the TB1-2 terminal and stop the generator set (drawing 626C0171).

SIMULATION OF POWER OUTAGE

To ensure the equipment is ready to assume load properly if an actual power outage occurs, the operator should periodically simulate a power outage to keep the fuel system filled and battery charged. Opening test transfer switch S1 breaks the circuit from line B (drawing 626C0106), terminal Y of receptacle J1, terminal Y of disconnect plug P1 (drawing 626C0071), through switch S1, TB1-4 and 5, contacts K6 (3-5), K10 (7-8), relay K3, terminal P1-X, J1-X (drawing 626C0106), to line A. Relay K3 is deenergized, contacts K3 (1-3) close and contacts K3 (5-6) open.

Two-Wire Starting

Relay K7 is deenergized, contacts K7 (1-5) close to connect battery positive voltage from TB1-B+ to the remote start terminal (TB1-RMT). The generator set starts and runs.

Three-Wire Starting

Relay K7 is deenergized (drawing 626C0171). Contacts K7 (3-5) open and contacts K7 (1-5) close to connect battery ground from TB1-1, through selector switch S2, M1 (4-5), K7 (1-5), K4 (1-2), K5 (1-2), TB1-H, and to TB1-3. The generator set starts and runs.

Generator output voltage from generator line B (drawing 626C0106), completes a circuit through TB7-7, TB6-7 (drawing 626C0071), resistor R4, relay K4, TB6-12, TB6-11, TB6-6, TB7-6 (drawing 626C0106), and to generator line A. Relay K4 is energized and contacts K4 (3-4) close. Transfer switch tripping coil K1-TC is energized from generator line B (drawing 626C0106) through normally-open K1 contacts, TB7-8, TB6-8 (drawing 626C0071), contacts K3 (1-3), K13 (5-L3), closed K4 contacts (3-4), TB6-6, TB7-6 (drawing 626C0106), to generator line A. The K1 trip coil operates to release the mechanically-held mechanism and to close contacts K1-IC. Contacts K1-IC complete the circuit to energize the K2 closing coil from generator side terminal B. Coil K2 then closes the main K2 contacts connecting the load to the generator side.

To end the test, move test transfer switch S1 back to "NORMAL" (drawing 626C0071). A circuit is now complete from the disconnect plug terminal P1-Y through test transfer switch S1 (2-1), TB1-4 and -5, K6 contacts (3-5), K10 (7-8) and K9 (7-8), relays K3 and K7, disconnect plug terminal P1-X, terminal J1-X (drawing 626C0106) and to normal line A. Relay K3 is energized (drawing 626C0071) and opens contacts K3 (1-3) and closes contacts K3 (5-6). Open contacts K3 (1-3) break the circuit to TB6-8 and to TB7-8 (drawing 626C0106) to deenergize the K2 closing coil. Power from normal line B (drawing 626C0106) completes a circuit through receptacle J1-Y, plug terminal P1-Y (drawing 626C0071), closed contacts K3 (5-6), disconnect plug terminal P1-W, receptacle terminal J1-W (drawing 626C0106), closed contacts K2-IC, K1-CS, closing coil K1-CC, to normal line A. Transfer switch contacts K2 open to remove the generator from the load and K1 contacts close to connect the load to the commercial power line.

Two-Wire Stopping

Relay contacts K7 (1-5) open to remove battery positive (B+) from the remote (RMT) terminal and stop the generator set. See drawing 626C0071.

Three-Wire Stopping

Relay contacts K7 (1-5) open and K7 (3-5) close to place battery ground on the TB1-2 terminal and stop the generator set (drawing 626C0171).

EXERCISER CLOCK
For AT-C and AT-D Models

The exerciser clock starts and stops the generator set automatically for periodic test and exercise

operations without load. The exerciser clock is connected to commercial power lines A and B through disconnect plug terminals X and Y. See drawing 626C0075. With 480- and 600-volt systems, the exerciser is connected to a stepdown transformer.

Cam-operated switch contacts M1 (3-5) connect battery positive (B+) to the remote start terminal (RMT). M1 contacts are shown in the normal position. After the operator selects the desired exercise periods, the exerciser clock automatically exercises the generator set.

For AT-E Models

The exerciser clock starts and stops the generator set automatically for periodic test and exercise operations without load. The exerciser clock is connected to commercial power lines A and B through disconnect plug terminals X and Y. See drawing 626C0175. With 480- and 600-volt systems, the exerciser is connected to a stepdown transformer.

Cam-operated switch contacts M1 (5-3) connect battery ground from TB1-GND, through selector switch S2 (1-5), to contacts K4 (2-1), K5 (1-2), TB1-H, and to TB1-3. M1 contacts are shown in the normal position. After the operator selects the desired exercise periods, the exerciser clock automatically exercises the generator set.

START TIME DELAY

The timer K7 operates on AC voltage and delays starting of the generator set if a power outage occurs. It is adjustable from 1 through 300 seconds. See drawing 626C0075. On 480- and 600-volt systems, a stepdown transformer (to 120 volts) is used to operate the time delay.

During a power outage, power from disconnect plug terminal P1-X, P1-Y, contacts K6 (3-5) and closed K4 contacts disappears. Upon deenergization, relay K7 begins its time delay. With two-wire starting, contacts K7 (1-5) close to connect battery voltage (B+) to the remote start terminal. With three-wire starting, contacts K7 (1-5) close to connect battery negative (B-) to TB1-H and TB1-3 (see drawing 626C0175). The generator set starts and runs.

TRANSFER TIME DELAY

This time delay operates on generator AC voltage and delays transfer of the load to the generator after the generator set starts (drawing 626C0075). It is adjustable from 1 through 300 seconds.

Once the generator set starts, a circuit is completed from generator line A (drawing 626C0106), TB7-6, TB6-6 (drawing 626C0075), TB6-11, TB6-12, relay K4, resistor R4, TB6-7, TB7-7 (drawing 626C0106), to generator line B. Relay K4 is energized (drawing 626C0075) and closes contacts K4 (3-4).

A circuit is now complete from TB6-6, through contacts K4 (3-4), transfer time delay K13, TB6-7, TB7-7 (drawing 626C0106), to generator line B. Transfer time delay K13 is energized and starts its time delay cycle. After the time delay, contacts K13 (1-5) close completing a circuit through normally-closed K3 contacts (1-3), TB6-8, TB7-8 (drawing 626C0106), K2 closing coil and contacts K1-IC to energize the K2 coil for transfer of the load to the generator side.

RETRANSFER TIME DELAY

Operating on commercial power, this time delay starts timing upon energization and delays retransfer of the load from the generator set to the line. When a power outage occurs, relays K6 and K3 are deenergized (drawing 626C0075). The generator set starts and energizes relay K4 which opens contacts K4 (5-6) and K4 (1-2).

When commercial line power resumes, relay K6 is energized and closes contacts K6 (3-5). A circuit is complete from line A, receptacle terminal J1-X (drawing 626C0106), plug terminal P1-X (drawing 626C0075), K10 retransfer time delay motor, contacts K10 (TDO), contacts K6 (3-5), TB1-4 and -5, test transfer switch S1, disconnect plug terminal P1-Y, terminal J1-Y (drawing 626C0106), to line B. Time delay relay K10 is energized (drawing 626C0075). After the time delay period expires (adjustable from 2 through 60 minutes), retransfer time delay motor closes contacts K10 (7-8) to complete the circuit to energize relay K3. Relay contacts K3 (1-3) open and K3 (6-5) close to initiate load transfer from the generator set to the normal line.

STOP TIME DELAY

When the load is transferred to commercial power after normal power is restored, the stop time delay allows the generator set to run a few minutes, adjustable from 2 to 60 minutes, without load before shutdown to promote engine cooling and temperature stabilization.

Returning commercial power completes a circuit from line A (drawing 626C0106), receptacle terminal J1-X, P1-X (drawing 626C0075), stop time delay motor K9, contacts K9 (TDO), K10 (7-8), K6 (3-5), TB1-4 and -5, test transfer switch S1, disconnect plug terminal P1-Y, J1-Y (drawing 626C0106), to line A. Stop time delay motor K9 is energized (drawing 626C0075). After the time delay period expires (adjustable from 2 through 60 minutes), time delay motor closes contacts K9 (7-8) to complete the circuit to and energize relay K7. Contacts K7 (1-5) open stopping a two-wire start generator set by removing B+ from the RMT terminal. Contacts K7 (1-5) open and K7 (3-5) close (drawing 626C0175) to remove battery ground from TB1-H and 3, and place battery ground on TB1-2 to stop a three-wire start generator set.

NORMAL AND EMERGENCY LAMPS

The green normal and red emergency lamps indicate which power source is supplying power to the load. During normal operation, the line supplies power from line A (drawing 626C0106), to TB7-11 (drawing 626C0164), to transformer T11 primary, back through TB7-10 (drawing 626C0106), contacts K2-IC, receptacle terminal J1-W, P1-W (drawing 626C0075), closed contacts K3 (6-5), disconnect plug terminal P1-Y, J1-Y (drawing 626C0106), to line B. Transformer T11-X1 and X2 supply approximately 40 volts to light green normal lamp DS11 (drawing 626C0164).

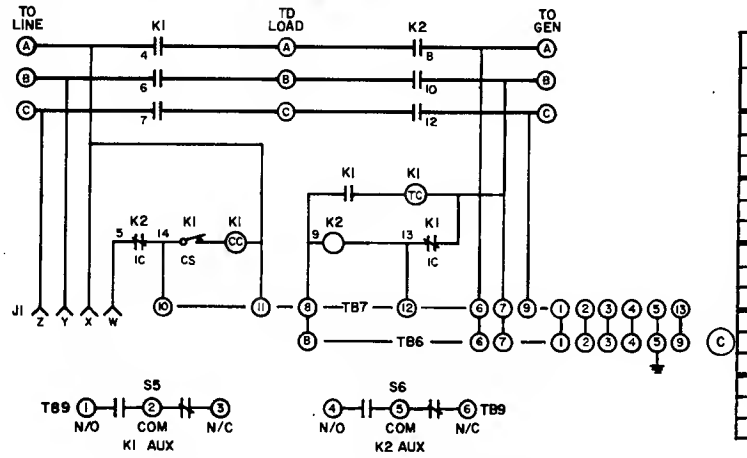
During generator standby operation, the generator supplies power from generator line A (drawing 626C0106), TB7-6, TB6-6 (drawing 626C0075), closed contacts K4 (3-4), K13 (1-5), K3 (1-3), TB6-8, TB7-8 (drawing 626C0164), through transformer primary T12-X1 and -X2, TB7-12 (drawing 626C0106), contacts K1-IC, to generator line B. The secondary of T12 (drawing 626C0164) lights red emergency lamp DS12. Both lamps are 56-volt lamps operating on 40 volts.

AUXILIARY CONTACTS ON LINE SIDE AND GENERATOR SIDE

Small switches mounted on the transfer switch, actuated by the moving armature, provide dry contacts to indicate transfer switch position. Diagram 626C0106 shows the K1 auxiliary contacts connecting to TB9 terminals 1, 2 and 3. The normally open contact connects to terminals 1 and 2 and the normally closed contact connects to terminals 2 and 3. The K2 auxiliary contacts S6 have a normally open contact connecting to terminal block TB9 terminals 4 and 5 and a normally closed contact connecting to terminals 5 and 6.

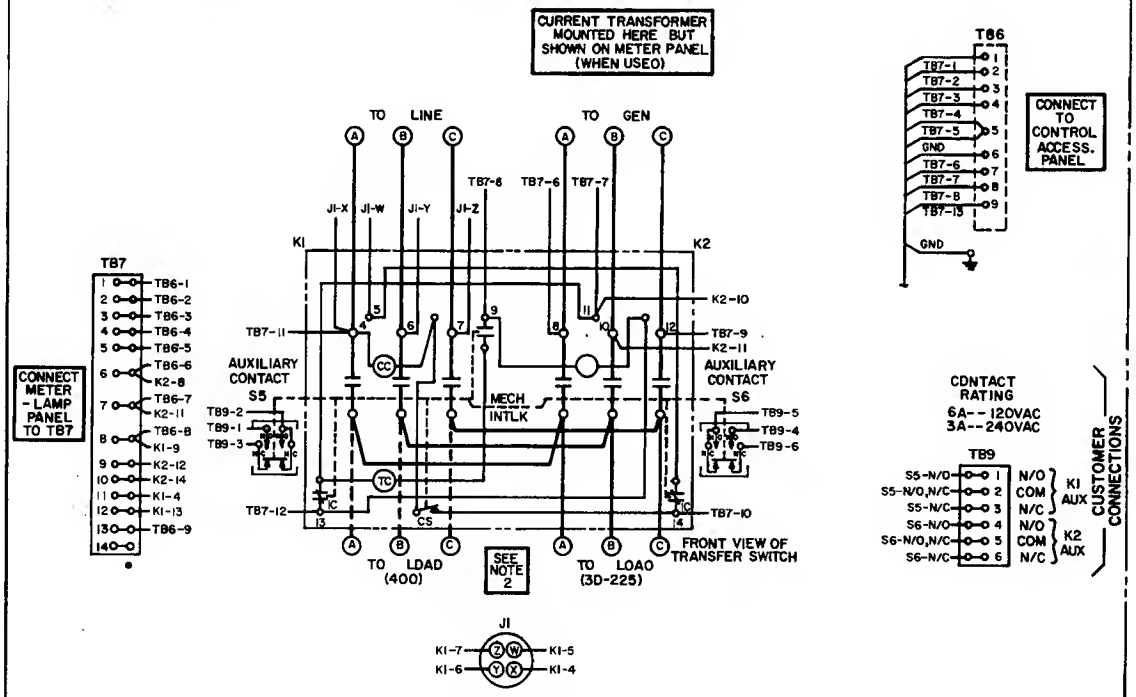
626-0106 Dwg Size C

SCHEMATIC DIAGRAM



THIS INFORMATION IS FOR MANUFACTURERS USE ONLY				
OASH NO	AMPERE	VOLTAGE	TRANSFER SWITCH	DWG SIZE
-01	30	208/240V	307-0926	C
-02		48DV	307-0927	C
-03		600V	307-0928	C
-04	60	208/240V	307-0497	C
-05		480V	307-0506	C
-06		600V	307-0581	C
-07	100	208/240V	307-0498	C
-08		480V	307-0507	C
-09		600V	307-0580	C
-10	225	208/240V	307-1225	C
-11		48DV	307-1226	C
-12		600V	307-1227	C
-13	400	208/240V	307-1208	C
-14		480V	307-1209	C
-15		600V	307-1210	C

WIRING DIAGRAM
INSIDE VIEW OF CONTROL BOX



PARTS LIST				
REF. DES.	PART NO.	Dwg Size	QTY	DESCRIPTION
J1	338-0880	B	1	HARNESS-DISC PLUG (30-225)
	338-0881	B	1	HARNESS-DISC PLUG (400)
	323-0900(REF)	A	1	RECEPTACLE
K1,K2	SEE CHART	-	1	TRANSFER SWITCH
S5,S6	307-0428	P	2	AUXILIARY CONTACT
TB7	338-0888	D	1	HARNESS-CABINET (30-225)
	338-0889	D	1	HARNESS-CABINET (400)
	332-1697(REF)	A	1	TERMINAL BLOCK
	332-1698	A	1	MARKER STRIP
TB9	338-0678	B	1	HARNESS-AUX CONTACT (30-225)
	338-0674	D	1	HARNESS-AUX CONTACT (400)
	332-0699(REF)	A	1	TERMINAL BLOCK
A	332-1516	A	1	MARKER STRIP
	98-2531	A	1	LABEL-WITHSTAND RATING (30)
	98-2532	A	1	LABEL-WITHSTAND RATING (60)
	98-2537	A	1	LABEL-WITHSTAND RATING (100)
	98-2534	A	1	LABEL-WITHSTAND RATING (225)
	98-2535	A	1	LABEL-WITHSTAND RATING (400)
B	98-2799	A	1	LABELS-TERMINAL BLOCK
	301-3778	D	1	CONTROL BOX (30-225)
	301-3779	D	1	CONTROL BOX (400)
	301-3579	C	1	DOOR ASSY (30-400)
	301-3578	C	1	DOOR ASSY (400)
	301-3512	B	1	BRACKET-CONTROL BOX CENTER (400)
	406-0363	A	2	HINGE-PIN
	508-0177	P	2	WASHER-NYLON
	301-3524	B	1	PLATE-STRIKER
D	99-1269	A	1	NAMEPLATE-CONTROL
	406-0370	A	1	PIN-LATCH
	332-1356	P	2	CLAMP-LOOP (30-225)
	332-1024	-	2	CLAMP-LOOP (400)
	332-1414	-	4	CLAMP-LOOP (30-225)
	332-1414	-	5	CLAMP-LOOP (400)
	332-0090	-	1	CLAMP-LOOP

626-0106

NOTES:
1. TRANSFER SW MECHANICALLY HELD LINE SIDE

CC -- CLOSING COIL
TC -- TRIP COIL
CS -- CUTOUT SWITCH
IC -- INTERLOCK CONTACT

2. CONNECT LOAD TO RIGHT SIDE OF TRANSFER SWITCH ON 30-225 AMP
CONNECT LOAD TO LEFT SIDE OF TRANSFER SWITCH ON 400 AMP

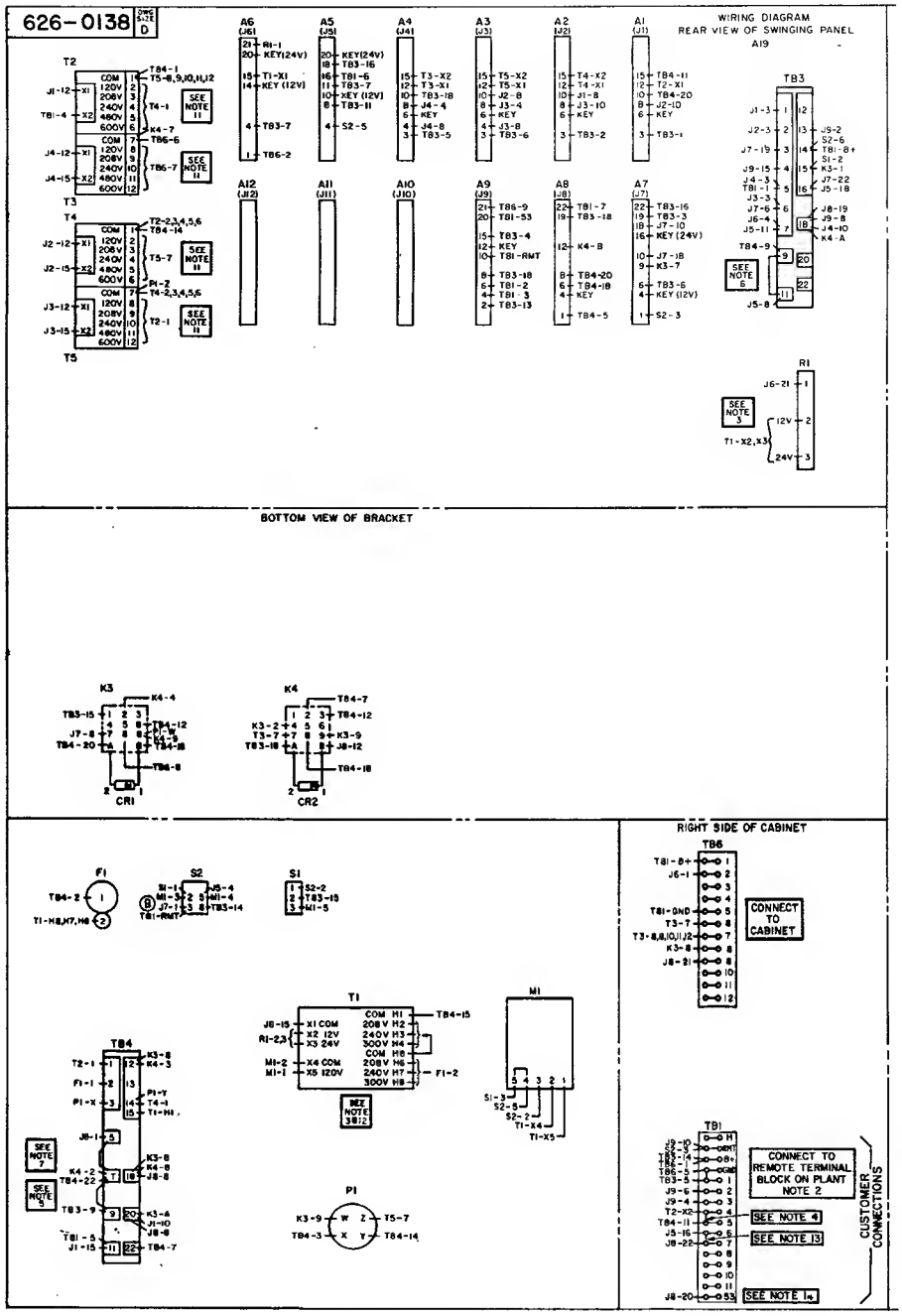
TRANSFER SWITCH-CABINET ASSY: C

TRANSFER SW MECHANICALLY HELD LINE SIDE
AUXILIARY CONTACTS LINE & GEN SIDE
CABINET (LESS METER PANEL)

LET	REVISION	DWN	ENGR	DATE
D	WAS 99-1261	WB	L.L.	10-7-76
C	WAS 200 AMP	WB	L.L.	5-5-76
B	ADDED 98-2799	CDR	JTV	2-2-76
A	WAS 332-0730	WB	JTV	10-8-75

PROD REL: JIM VINT 5-1-74
PROD REL:
MODEL: AT CC, AT DC, AT EC } SPEC B
208,240,480,600V., 3PH., 4W., 50/60Hz

Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
DATE 4-12-74 DR RMS ENGR JIM VINT APPR CDR
TRANSFER SWITCH-CABINET ASSY (WIRING DIAGRAM)
SERIAL PREFIX: DWG NO. 626-0106 SIZE C


626-0138
SHEET D
WIRING DIAGRAM
REAR VIEW OF SWINGING PANEL
A19
BOTTOM VIEW OF BRACKET
RIGHT SIDE OF CABINET
CONNECT TO CABINET
CONNECT TO REMOTE TERMINAL BLOCK ON PLANT NOTE 2
CUSTOMER CONNECTIONS
SEE NOTE 4
SEE NOTE 13
SEE NOTE 14
SEE NOTE 11
SEE NOTE 3
SEE NOTE 6
SEE NOTE 7
SEE NOTE 8
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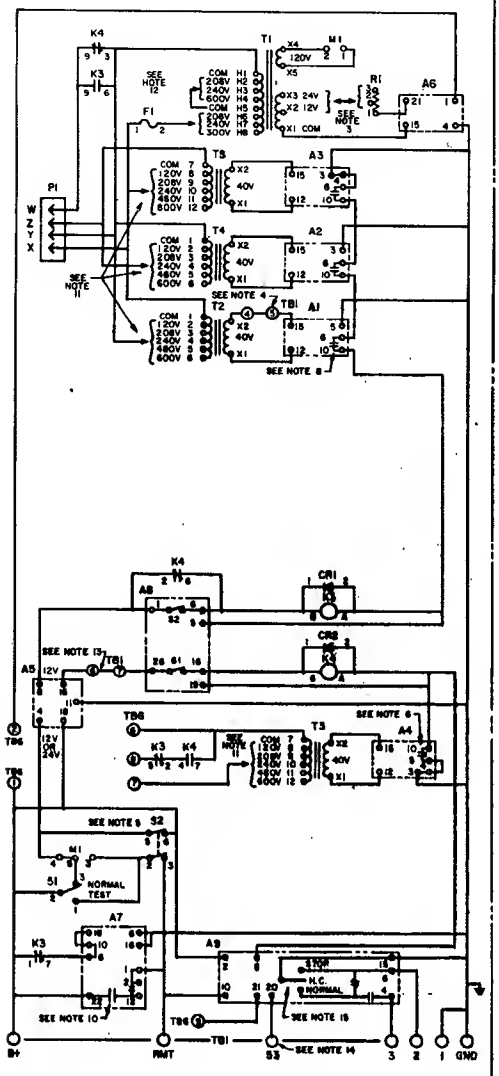
SCHEMATIC DIAGRAM

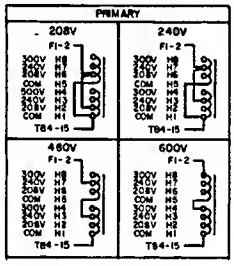


NOTES:

1. ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION UNLESS OTHERWISE NOTED
2. 2 WIRE START ON AT C & AT D CONNECT TO B+,GND & RMT 3 WIRE START ON AT E CONNECT TO B+,1,2,& 3
3. FOR 12V BATTERY CONNECT WIRE MARKED T1-X2,X3 R1-2,3 BETWEEN T1-X2 &R1-2 (AT D&E) FOR 24V BATTERY CONNECT WIRE MARKED T1-X2,X3 R1-2,3 BETWEEN T1-X3 &R1-3 (AT C)
4. TO ADD AREA PROTECTION EQUIPMENT, OR REMOTE TEST TRANSFER SWITCH, REMOVE JUMPER BETWEEN TB1-4 & 5
5. TO ADD OVER-VOLTAGE SENSING, REMOVE JUMPER BETWEEN TB4-7 & 9
6. TO ADD OVER & UNDER FREQ SENSING, REMOVE JUMPER BETWEEN TB3-9 & 11
7. TO ADD PUSH TO RETRANSFER (MOTOR TIMER) REMOVE JUMPER BETWEEN TB4-5 & 7
8. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH THAT CLOSES WHEN VOLTAGE IS NORMAL (A1,A2,A3,& A4)
9. TEST OR EXERCISE (S2 SHOWN IN WITHOUT LOAD POSITION)
   - 9.1. WITH LOAD - PLANT STARTS AND TAKES OVER LOAD. PLANT RUNS FOR DURATION OF TEST OR EXERCISE PERIOD PLUS ANY TIME DELAYS
   - 9.2. WITHOUT LOAD - PLANT STARTS AND RUNS FOR DURATION OF TEST OR EXERCISE PERIOD
10. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH WHICH CLOSES AFTER 0.5 SEC TO 15 SEC DELAY AND OPENS AFTER A 0.5 MIN TO 5 MIN DELAY
11. WIRE TRANSFORMERS T2,3,4 & 5 AS FOLLOWS

FOR 208V CONNECT	T4-1 TO T2-3	
	TB6-7 TO T3-9	
	T5-7 TO T4-3	
	T2-1 TO T5-9	
FOR 240V CONNECT	T4-1 TO T2-4	
	TB6-7 TO T3-10	
	T5-7 TO T4-4	
	T2-1 TO T5-10	
FOR 480V CONNECT	T4-1 TO T2-5	
	TB6-7 TO T3-11	
	T5-7 TO T4-5	
	T2-1 TO T5-11	
FOR 600V CONNECT	T4-1 TO T2-8	
	TB6-7 TO T3-12	
	T5-7 TO T4-8	
	T2-1 TO T5-12	

12. WIRE T1 TRANSFORMER AS FOLLOWS:



13. TO ADD PARALLELING SWITCH BOARD TRANSFER INHIBIT CIRCUIT, REMOVE JUMPER TB1-6 & 7
14. OVERCRANK SIGNAL ON AT E ONLY. CONNECT TO TERMINAL 83 IN REMOTE ANNUNCIATOR
15. 2 TO 3 WIRE CONVERTER (USED ON AT E ONLY)
    THE SELECTOR SWITCH HAS THREE POSITIONS:
    - STOP ------ SHUTS DOWN THE PLANT AND PREVENTS IT FROM STARTING. USE THIS POSITION WHEN SERVICING THE PLANT.
    - NORMAL ---- ALLOWS THE PLANT TO START AND ASSUME THE LOAD IF A LINE FAILURE OCCURS.
    - HAND CRANK - PREVENTS AUTOMATIC PLANT STARTING BUT ALLOWS STARTING AND STOPPING AT THE PLANT. USE THIS POSITION FOR PLANT MAINTENANCE.

CONTROL ACCESSORY GROUP: 11
BATTERY CHARGER MODULE
3 UNDER VOLTAGE SENSOR MODULES (LINE)
1 UNDER VOLTAGE SENSOR MODULE (GEN)
NORMAL - TEST SWITCH
WITH LOAD - WITHOUT LOAD SWITCH
2 TO 3 CONVERTER (AT E ONLY)

TO START - STOP

PARTS LIST

REF DES	PART NO	ASS'Y SIZE	QTY	DESCRIPTION
A1,2,3	300-0780	C	3	UNDER VOLTAGE SENSOR (LINE)
A4	300-0780	C	1	UNDER VOLTAGE SENSOR (GEN)
A5	300-0847	B	1	MODULE - VOLTAGE 12V (AT D&E)
	300-0848	B	1	MODULE -24V TO 12V CONVERTER (AT C)
A6	300-0793	C	1	BATTERY CHARGER-2 AMP 12V (AT D&E)
	300-0794	C	1	BATTERY CHARGER - 2 AMP 24V (AT C)
A7	300-0921	C	1	TD START-STOP 12V (AT D&E)
	300-0922	C	1	TD START - STOP 24V (AT C)
				0.5 SEC TO 15 SEC DELAY ON START
				0.5 SEC TO 5 MIN DELAY ON STOP
AB	300-0927	B	1	BYPASS PLUG - TRANSFER
				SET S1 ON & S2 ON
A9	300-0937	B	1	MODULE-BLANK (SPARE) (AT C & D)
	300-0926	C	1	2 TO 3 WIRE CONVERTER (AT E)
A10	300-0937	B	1	MODULE-BLANK (SPARE)
A11,12	300-0937	B	2	MODULE - BLANK (SPARE)
A19	300-1134	C	1	PANEL ASSY - SWINGING
F1	321-0180(REF)	P	1	FUSE - 1 AMP 600V
	321-0178(REF)	P	1	FUSE - HOLDER
K3	307-1058	B	1	RELAY - INTERPOSING LINE 12V
K4	307-1058	B	1	RELAY - INTERPOSING GEN 12V
M1	332-1484	A	1	PLATE - CLOCK COVER
P1	323-0901(REF)	A	1	PLUG - LINE DISCONNECT
R1	383-0044(REF)	A	1	RESISTOR - 6 OHM 2.5 OHM YAP 75W
S1	308-0326(REF)	P	1	SWITCH - TEST TRANSFER
S2	308-0328(REF)	P	1	SWITCH - SELECTOR
T1	315-0379(REF)	B	1	TRANSFORMER - BAT CHARGER
T2-5	315-0374(REF)	C	2	TRANSFORMER ASSY - STEPDOWN
TB1	332-1499	A	1	MARKER STRIP
TB6	332-1469	A	1	MARKER STRIP
	338-0777(REF)	E	1	HARNESS - MAIN
(A)	332-1278	-	9	PLUG - KEYING
	301-3693	B	1	COVER - RACK
	332-0060	-	1	CLIP - WIRE

THIS INFORMATION IS FOR MANUFACTURERS USE ONLY	
MODEL	50/60Hz
AT C	-01
AT D	-02
AT E	-03

B	93-3.77-1 WAS 71-1		2-1-77
A	332-1278 WAS 332-1279	CM	2-2-76
LET	REVISIONS	APP'D	DATE

Onan — DIVISION OF ONAN CORPORATION — MINNEAPOLIS, MINNESOTA

DRAWN: Jim Hunt 5-1-74 | DATE: 4-9-74 | APP'D: COR | SCALE: None | SHEET: 1 of 1

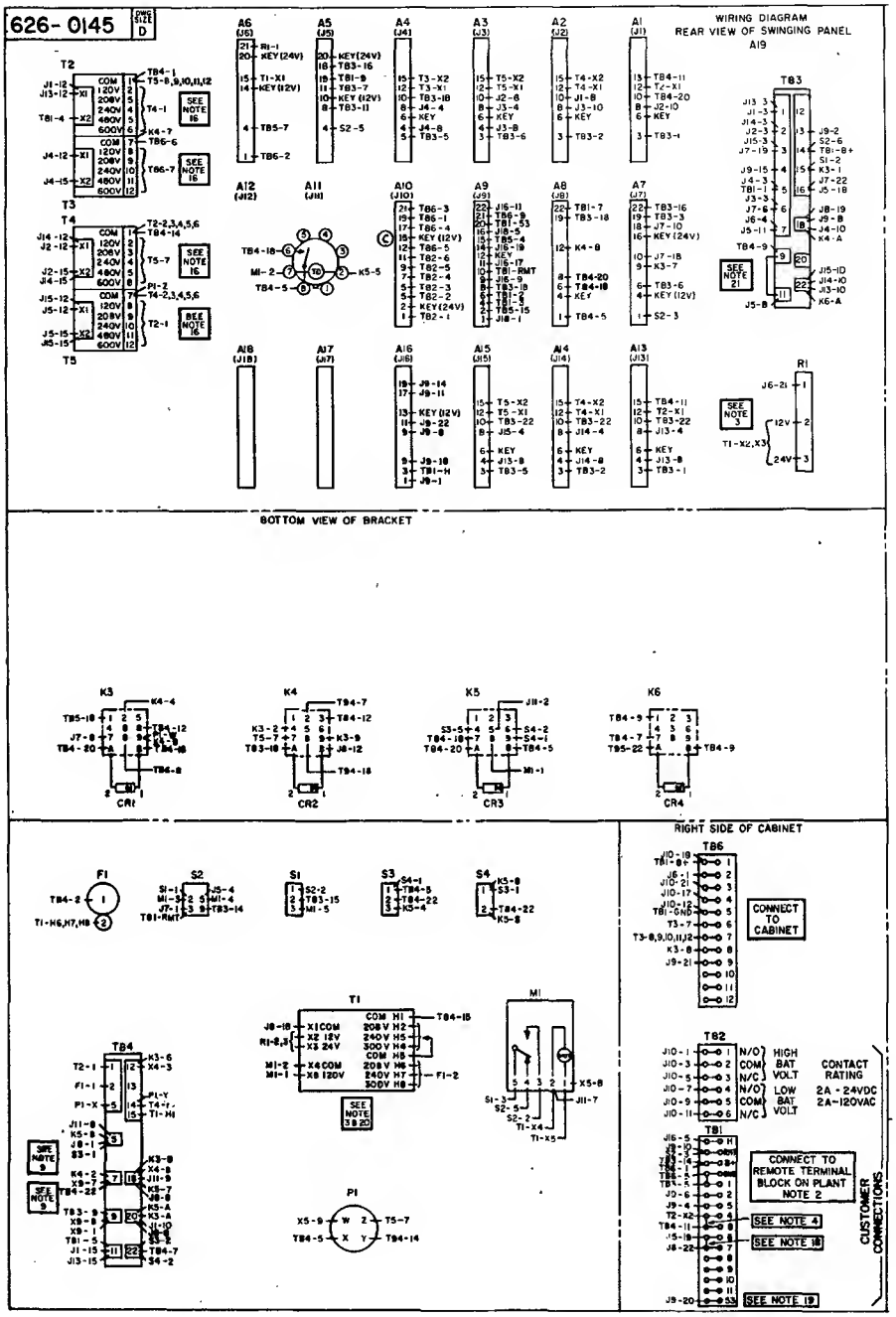
AT C, AT D, AT E } SPEC B

208,240,480,600V, 3PH., 4W., 50/60Hz

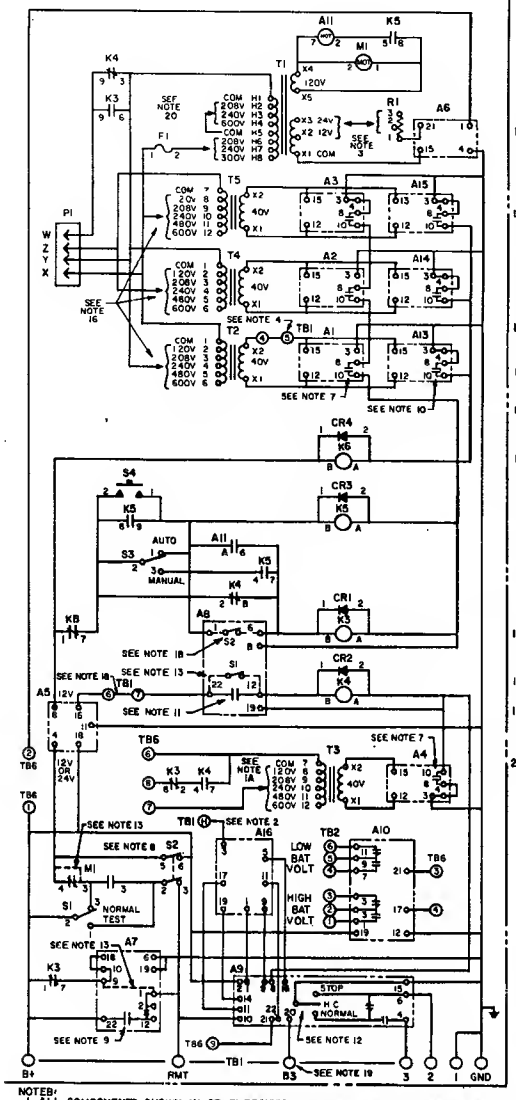
CONTROL ACCESS. PANEL (WIRING DIAGRAM)

626-0138 | SIZE D

626-0138


626-0145
WIRING DIAGRAM
REAR VIEW OF SWINGING PANEL
A19
BOTTOM VIEW OF BRACKET
RIGHT SIDE OF CABINET
CONNECT TO CABINET
CONNECT TO REMOTE TERMINAL BLOCK ON PLANT NOTE 2
CUSTOMER CONNECTIONS
CONTACT RATING
2A - 24VDC
2A-120VAC
HIGH BAT VOLT
LOW BAT VOLT
SEE NOTE 4
SEE NOTE 18
SEE NOTE 19

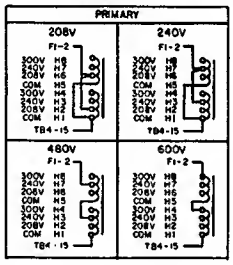
SCHEMATIC DIAGRAM



8. TEST OR EXERCISE IS2 SHOWN IN WITHOUT LOAD POSITION)
   8.1. WITH LOAD-PLANT STARTS AND TAKES OVER LOAD. PLANT RUNS FOR DURATION OF TEST OR EXERCISE PERIOD PLUS ANY TIME DELAYS
   8.2. WITHOUT LOAD-PLANT STARTS AND RUNS FOR DURATION OF TEST OR EXERCISE PERIOD
9. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH WHICH CLOSES AFTER A 0.5 SEC TO 10 SEC DELAY AND OPENS AFTER A 0.5 MIN TO 5 MIN DELAY
10. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH THAT CLOSES WHEN VOLTAGE GOES ABOVE NORMAL (A13, A14 & A15)
11. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH THAT CLOSES AFTER A DELAY OF 0.5 SEC TO 10 SEC DELAY ON LOAD TRANSFER
12. 2 TO 3 WIRE CONVERTER (AT E ONLY)
    THE SELECTOR SW HAS THREE POSITIONS·
    STOP ------STOPS PLANT, PREVENTS STARTING. USE THIS POSITION FOR SERVICING PLANT
    NORMAL ---ALLOWS PLANT TO START, ASSUMES LOAD IF A LINE FAILURE OCCURS.
    HAND CRANK-PREVENTS AUTOMATIC START, ALLOWS STARTING & STOPPING AT THE PLANT. USE THIS POSITION FOR PLANT MAINTENANCE.
13. THIS DASHED LINE REPRESENTS A JUMPER CIRCUIT THAT MUST BYPASS A CONTACT OR CLOSE A CIRCUIT TO OPERATE WITHOUT THE REFERENCED MODULE
14. S2 IS SET IN "ON" POSITION AT FACTORY. WHEN ADDING TO RETRANSFER (MOTOR) TIMER SET S2 TO "OFF" POSITION
15. WHEN ADDING TO TRANSFER WITHOUT A TD RETRANSFER (MOTOR) TIMER ADD WIRE JUMPER BETWEEN TERMINAL 1 & 6 ON THE TD TRANSFER BOARD
16. WIRE TRANSFORMERS T2,3,4 & 5 AS FOLLOWS

FOR 208V CONNECT	T4 - 1 TO T2 - 3	
	T85 - 7 TO T3 - 9	
	T5 - 7 TO T4 - 3	
FOR 240V CONNECT	T2 - 1 TO T5 - 9	
	T4 - 1 TO T2 - 4	
	T85 - 7 TO T3 - 10	
	T5 - 7 TO T4 - 4	##
	T2 - 1 TO T8 - 10	##
FOR 480V CONNECT	T4 - 1 TO T2 - 5	
	T86 - 7 TO T3 - 11	
	T5 - 7 TO T4 - 5	
	T2 - 1 TO T5 - 10	
FOR 600V CONNECT	T4 - 1 TO T2 - 6	
	T86 - 7 TO T3 - 12	
	T5 - 7 TO T4 - 6	
	T2 - 1 TO T3 - 12	

17. WIRING DIAGRAM SHOWS CIRCUIT AS IF ALL ADDER PACKAGES WERE INSTALLED, PLUS IT SHOWS JUMPERS REQUIRED WHEN THEY ARE NOT INSTALLED
18. TO ADD PARALLELING SWITCH BOARD TRANSFER INHIBIT CIRCUIT, REMOVE JUMPER TBI-8 & 7
19. OVERCRANK SIGNAL ON AT E ONLY. CONNECT TO TERMINAL 53 IN REMOTE ANNUNCIATOR
20. WIRE T1 TRANSFORMER AS FOLLOWS·



NOTES·
1. ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION UNLESS OTHERWISE NOTED
2. 2 WIRE START ON AT C & AT D CONNECT TO B+, I, 2 & 3 (PLUS H ON DIESELS)
   3 WIRE START ON AT E CONNECT TO B+, I, 2 & 3 (PLUS H ON DIESELS)
3. FOR 12V BATTERY CONNECT WIRE MARKED T1-X2, X3 R1-2, 3 BETWEEN T1-X2 & R1-2 (AT C & AT E)
   FOR 24V BATTERY CONNECT WIRE MARKED T1-X2, X3 R1-2, 3 BETWEEN T1-X3 & R1-3 (AT C)
4. TO ADD AREA PROTECTION EQUIPMENT, OR REMOTE TEST TRANSFER SWITCH, REMOVE JUMPER BETWEEN TBI-4 & 5
5. REMOVE JUMPER BETWEEN TB4-7 & 9
6. REMOVE JUMPER BETWEEN TB4-5 & 7
7. THIS CONTACT SYMBOLIZES A SOLID STATE SWITCH THAT CLOSES WHEN VOLTAGE IS NORMAL (A1, A2, A3, & A4)
21. TO ADD OVER & UNDER FREQ SENSING, REMOVE JUMPER BETWEEN TB3-9 & 11

626-C145

PARTS LIST

REF DES	PART NO	SPEC	QTY	DESCRIPTION	
A1,2,3	300-0780	C	3	UNDER VOLTAGE SENSOR	(LINE)
A4	300-0780	C	1	UNDER VOLTAGE SENSOR	(GEN)
A5	300-0847	B	1	MODULE-VOLTAGE 12V	(AT D & E)
	300-0848	B	1	MODULE-24V TO 12V CONVERTER	(AT C)
A6	300-0937	B	1	MODULE-BLANK (SPARE)	
#	300-0793 (REF)	C	1	BATTERY CHARGER-2 AMP	(AT D & E)
#	300-0794 (REF)	C	1	BATTERY CHARGER-2 AMP	(AT C)
A7	300-1177	B	1	BYPASS PLUG-START STOP	
#	300-092 (REF)	C	1	TD START-STOP 12V	(AT D & E)
#	300-0922 (REF)	C	1	TD START-STOP 24V	(AT C)
				0.5 SEC TO 10 SEC DELAY ON START	
				0.5 SEC TO 5 MIN DELAY ON STOP	
A8	300-0927	B	1	BYPASS PLUG-TRANSFER	
				SET S1 ON & S2 (SEE NOTE 14)	
#	300-0924 (REF)	C	1	TD TRANSFER (SEE NOTE 15)	
				0.5 SEC TO 10 SEC DELAY	
A9	300-0937	B	1	MODULE-BLANK (SPARE)	(AT C & D)
	300-0926	C	1	2 TO 3 WIRE CONVERTER	(AT E)
A10	300-0937	B	1	MODULE-BLANK (SPARE)	
#	300-0796 (REF)	C	1	BATTERY VOLTAGE SENSOR	(AT D & E)
#	300-0797 (REF)	C	1	BATTERY VOLTAGE SENSOR	(AT C)
A11,12	300-0937	B	2	MODULE-BLANK (SPARE)	
#					
#	307-1199 (REF)	B	1	ASSY-RETRANSFER 120V	50/60Hz
A13,14,15	300-0937	B	3	MODULE-BLANK (SPARE)	
#	300-0780 (REF)	C	1	OVER VOLTAGE SENSOR	(LINE)
#	300-0780 (REF)	C	3	OVER VOLTAGE SENSOR	(LINE)
A16	300-0937	B	1	MODULE-BLANK (SPARE)	
#	300-1072 (REF)	C	1	MODULE-TD PREHEAT	
A17,18	300-0937	B	2	MODULE-BLANK (SPARE)	
A19	300-1134	C	1	PANEL ASSY-SWINGING	
F1	321-0180 (REF)	P	1	FUSE-1 AMP 600V	
	321-0179 (REF)	P	1	FUSE-HOLDER	
K3	307-1058	B	1	RELAY-INTERPOSING LINE	12V
K4	307-1058	B	1	RELAY-INTERPOSING GEN	12V
K5	307-1058	B	1	RELAY-TIME & RETRANSFER	12V
K6	307-1058	B	1	RELAY-OVER VOLTAGE LINE	12V
M1	301-3487	A	1	PLATE-CLOCK COVER	
##	307-1104 (REF)	B	1	CLOCK-PLANT EXERCISER 120V	50Hz
##	307-1102 (REF)	B	1	CLOCK-PLANT EXERCISER 120V	60Hz
P1	323-0901 (REF)	A	1	PLUG-LINE DISCONNECT	
R1	353-0046 (REF)	A	1	RESISTOR-6 OHM 2.5 OHM TAP	75W
S1	308-033 (REF)	P	1	SWITCH-TEST TRANSFER	
S2	308-0322 (REF)	P	1	SWITCH-SELECTOR	
S3	308-0321	P	1	SWITCH-MANUAL & AUTO	
S4	308-0175	A	1	SWITCH-RETRANSFER	
T1	315-0379 (REF)	B	1	TRANSFORMER-BATTERY CHARGER	
T2-5	315-0374 (REF)	C	2	TRANSFORMER ASSY-STEPDOWN	
TB1	332-1899	A	1	MARKER STRIP	
TB2	332-1516	A	1	MARKER STRIP	
TB6	332-1469	A	1	MARKER STRIP	
	338-0777 (REF)	E	1	HARNESS-MAIN	
	338-0664	C	1	HARNESS-RETRANSFER	
	338-0657	D	1	HARNESS-OVER V	
	338-0658	C	1	HARNESS-BAT V	
	338-0677	C	1	HARNESS-MOTOR TIMER	
	338-077D	C	1	HARNESS-TO PREHEAT	
	332-1276	-	9	PLUG-KEYING	
	323-0814	P	15	GUIDES-PC BOARD	
	307-1157	P	2	SPRING-RELAY HOLD-DOWN	

(D)

CONTROL ACCESSORY GROUP: 15
STANDARD
3 UNDER VOLTAGE SENSORS (LINE)
1 UNDER VOLTAGE SENSOR (GEN)
2 TO 3 WIRE CONVERTER (AT E ONLY)
NORMAL-TEST SWITCH
WITHLOAD-WITHOUT LOAD SW
MANUAL PUSH TO RETRANSFER
PLUG-IN-MODULE PACKAGE'S
BATTERY CHARGER MODULE

3 OVER VOLTAGE SENSORS (LINE)
TD START STOP
TD RETRANSFER (MOTOR)
TD TRANSFER
TD PREHEAT
BATTERY VOLTAGE SENSORS
WIRE-IN-PACKAGE'S
EXERCISER CLOCK

D	332-1276 WAS 332-1279	CDR	-V	1-2-76
C	340T WAS 16	CDR	-V	9-12-74
B	A7 WAS 300-0987		-V	8-8-74
A	A9,3 WAS 300-0967		-V	8-8-74

-01	AT C	SPEC B	
-02	AT D		
-03	AT E		

208, 240, 480, 600V., 3PH., 50/60Hz

Onan — DIVISION OF Onan CORPORATION, Minneapolis, Minnesota

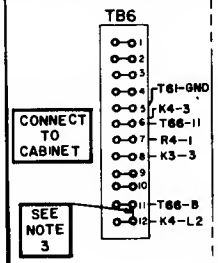
DATE 3-25-74 BY CDR FROM ENG. MGR. CHK. W.J.B.

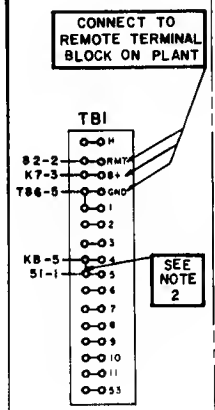
CONTROL ACCESS. PANEL (WIRING DIAGRAM)

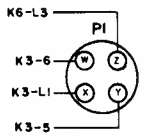
DRWG FROM 626-0145 SHT NO 1 OF 1 REV D

626-0071

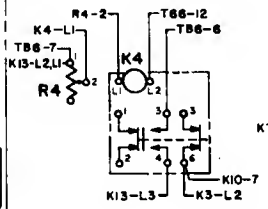
INSIDE VIEW OF TRANSFER SW CABINET OR SWINGING PNL HOUSING

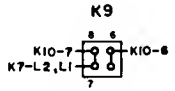


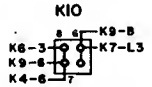


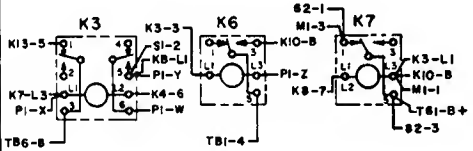


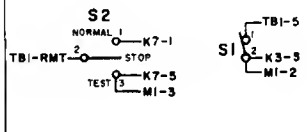
WIRING DIAGRAM
REAR VIEW OF SWINGING PANEL

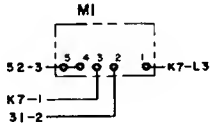






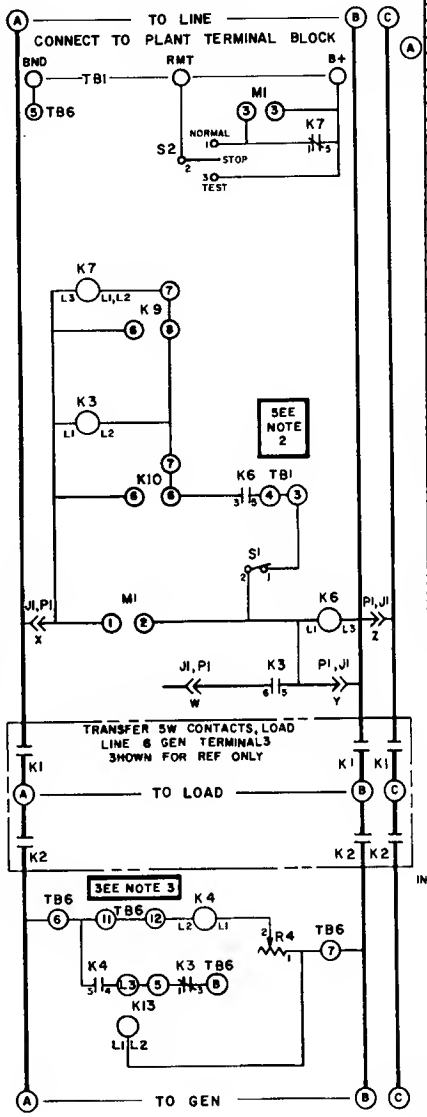






NOTES:
1. ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION, UNLESS OTHERWISE NOTED
2. TO ADD AREA PROTECTION EQUIPMENT, OR REMOTE TEST TRANSFER SWITCH, REMOVE JUMPER 6 CONNECT TO TBI-4 & 3
3. TO ACTIVATE TRANSFER-INHIBIT CIRCUIT, REMOVE JUMPER 8 CONNECT TO TB6-11 & 12

SCHEMATIC



PARTS LIST					
REF. DES.	PART NO	PRV SIZE	QTY	*BULK	DESCRIPTION
K3	307-1113	B	1		RELAY-INTERPOSING LINE (208V)
	307-1083	B	1		RELAY-INTERPOSING LINE (240V)
K4	307-0864	C	1		RELAY-INTERPOSING GEN
K6	307-1114	B	1		RELAY-PHASE PROTECTION (208V)
	307-1081	B	1		RELAY-PHASE PROTECTION (240V)
K7	307-1114	B	1		RELAY-START STOP (208V)
	307-1081	B	1		RELAY-START STOP (240V)
	301-3373	A	1		PLATE-RELAY MTG
K9,K10	301-3639	A	2		BYPASS ASSY-RELAY
K13	301-3640	A	1		BYPASS ASSY-RELAY
MI	332-1484	A	1		TERMINAL BLOCK ASSY (CLOCK BYPASS)
P1	323-0901	A	1		PLUG-LINE DISCONNECT
	301-3785	A	2		PLATE-PANEL INTERLOCK
	*503-0276	P	13'		HOSE
R4	304-0131	A	1		RESISTOR, 750Ω, 23W
S1	308-0089	P	1		SWITCH-TEST TRANSFER
S2	308-0138	A	1		SWITCH-SELECTOR
T61	332-1698	A	1		MARKER STRIP
TB6	332-1489	A	1		MARKER STRIP
	301-3825	D	1		PANEL-SWINGING RELAY
	99-2793	D	1		SILKSCREEN-PANEL (FRONT)
	99-2798	D	1		SILKSCREEN-PANEL (REAR)
	403-1872	A	2		CLIP-DOOR
	526-0003	—	2		WASHER-FLAT
	818-0150	—	2		RIVET-DRIVE
	338-0923	E	1		WIRING HARNESS-MAIN
	301-2259	A	1		PLATE-COVER
	301-3842	A	1		PLATE-COVER

1200-929

CONTROL ACCESSORY GROUP 01
INCLUDES ALL STANDARD ITEMS

-01	240V
-02	208V

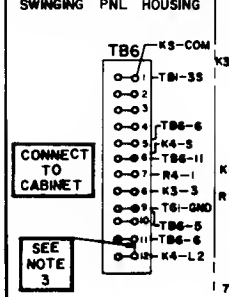
A	K6 WAS 307-0114	MD	JW	2-14-75
LET	REVISION	CKD	ENGR	DATE

Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

MODEL NO	DATE 1-6-75	DR. AOB	CKD. CDR
AT C AT D	NAME CONTROL ACCESS. PANEL (WIRING DIAGRAM)		
208/240V, 3 PH, 4W, 50/60 Hz	SEPIA FROM 626-0073	DWG NO 626-0071	DWG SIZE C

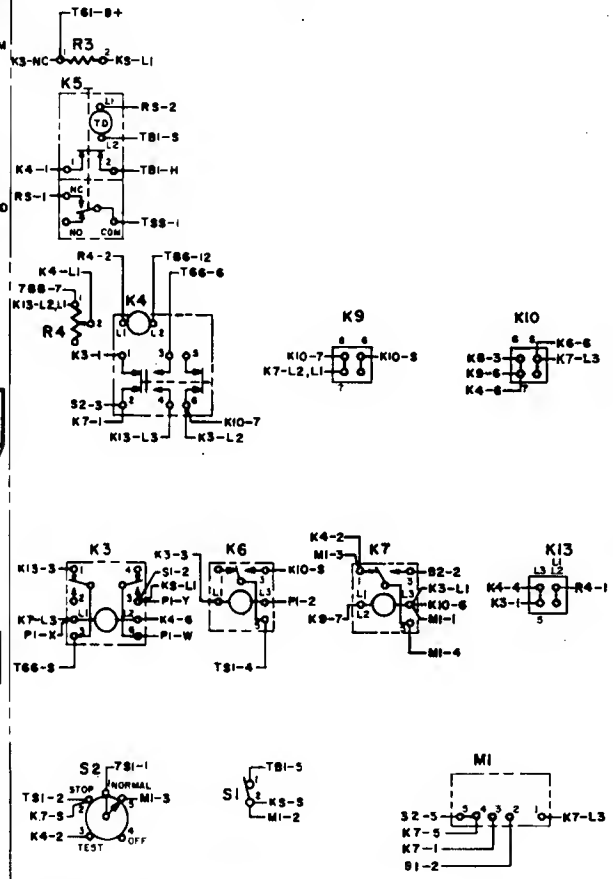
626-0171

INSIDE VIEW OF TRANSFER SW CABINET OR SWINGING PNL HOUSING



WIRING DIAGRAM

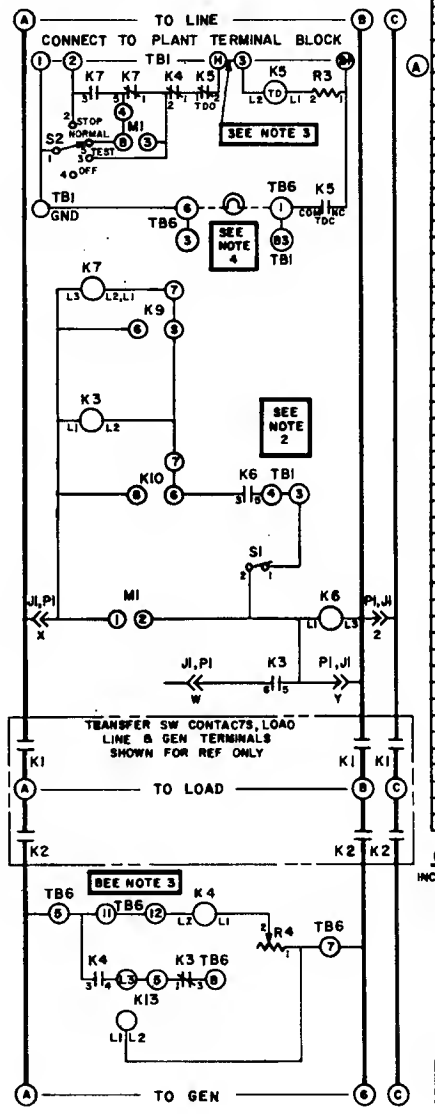
REAR VIEW OF SWINGING PANEL



NOTES:

1. ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION, UNLESS OTHERWISE NOTED
2. TO ADD AREA PROTECTION EQUIPMENT, OR REMOTE TEST TRANSFER SWITCH, REMOVE JUMPER 8 CONNECT TO TBI-4 & 5
3. TO ACTIVATE TRANSFER-INHIBIT CIRCUIT, REMOVE JUMPER 8 CONNECT TO T65-11 & 12
4. OVERCRANK SIGNAL, CONNECT TO TERMINAL 33 IN REMOTE ANNUNCIATOR
5. TO ADD TD PREHEAT, REMOVE JUMPER 8 CONNECT TO PREHEAT TO TERMINALS H, B+ & 3 ON TBI

SCHEMATIC



PARTS LIST

REF. DES.	PART NO.	SPEC SIZE	QTY	BULK	DESCRIPTION
K5	307-1113	B	1		RELAY-INTERPOSING LINE (208V)
	307-1063	B	1		RELAY-INTERPOSING LINE (240V)
K4	307-0684	C	1		RELAY-INTERPOSING GEN
K3	320-0221	B	1		CRANKING LIMITER ASSY
K6	307-1114	B	1		RELAY-PHASE PROTECTION (208V)
	307-1081	B	1		RELAY-PHASE PROTECTION (240V)
K7	307-1114	B	1		RELAY-START STOP (208V)
	307-1061	B	1		RELAY-START STOP (240V)
	301-3375	A	1		PLATE-RELAY MTG
K8,10	301-3636	A	2		BYPASS ASSY-RELAY
K13	301-3840	A	1		BYPASS ASSY-RELAY
MI	332-1464	A	1		TERMINAL BLOCK ASSY (CLOCK BYPASS)
PI	323-0901	A	1		PLUG-LINE DISCONNECT
	301-3788	A	2		PLATE-PANEL INTERLOCK
	#503-0276	P	18"		HOSE
R3	353-0086	A	1		RESISTOR, 5 Ω, 10W
R4	304-0131	A	1		RESISTOR, 750 Ω, 25W
SI	308-0088	P	1		SWITCH-TEST TRANSFER
S2	306-0163	A	1		SWITCH-SELECTOR
	303-0078	—	1		KNOB
T6I	332-1866	A	1		MARKER STRIP
T86	332-1466	A	1		MARKER STRIP
	301-3623	D	1		PANEL-SWINGING RELAY
	88-2785	D	1		SILKSCREEN-PANEL (FRONT)
	88-2786	D	1		SILKSCREEN-PANEL (REAR)
	405-1872	A	2		CLIP-DOOR
	525-0003	—	2		WASHER-FLAT
	318-0150	—	2		RIVET-DRIVE
	336-0921	E	1		WIRING HARNESS-MAIN
	301-2259	A	1		PLATE-COVER

1210-929

CONTROL ACCESSORY GROUP 01
INCLUDES ALL STANDARD ITEMS

-01	240V
-02	208V

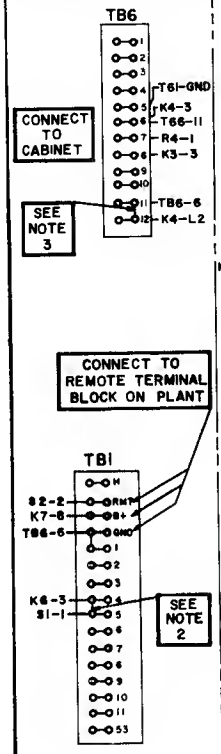
REV	REVISION	BY	DATE
A	K6 WAS 307-0114	MS	2-14-75

Onan — DIVISION OF ONAN CORPORATION

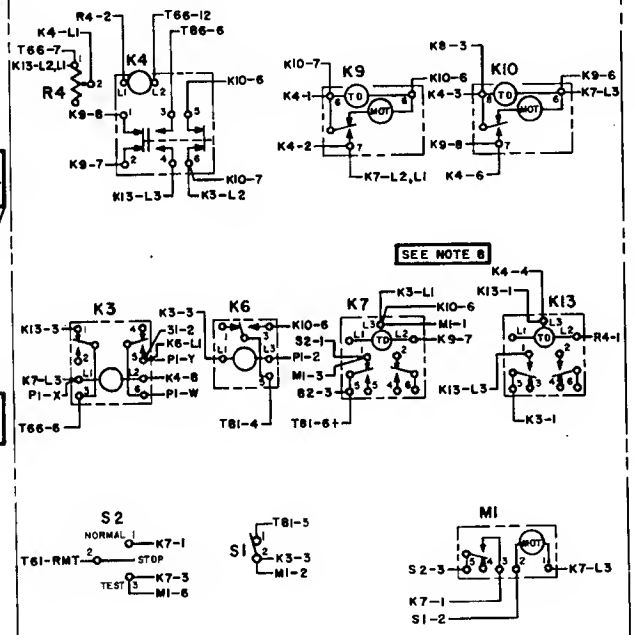
SPEC NO	AT E
DATE	1-6-75
BY	AD6
DRAWN	JIM VINT
TITLE	CDR
NAME	CONTROL ACCESS. PANEL (WIRING DIAGRAM)
208/240V, 3 PH, 4W, 50/60 Hz	
APPR FROM	626-0173
DWG NO	626-0171
SIZE	C

626-0075

INSIDE VIEW OF TRANSFER SW CABINET OR SWINGING PNL HOUSING

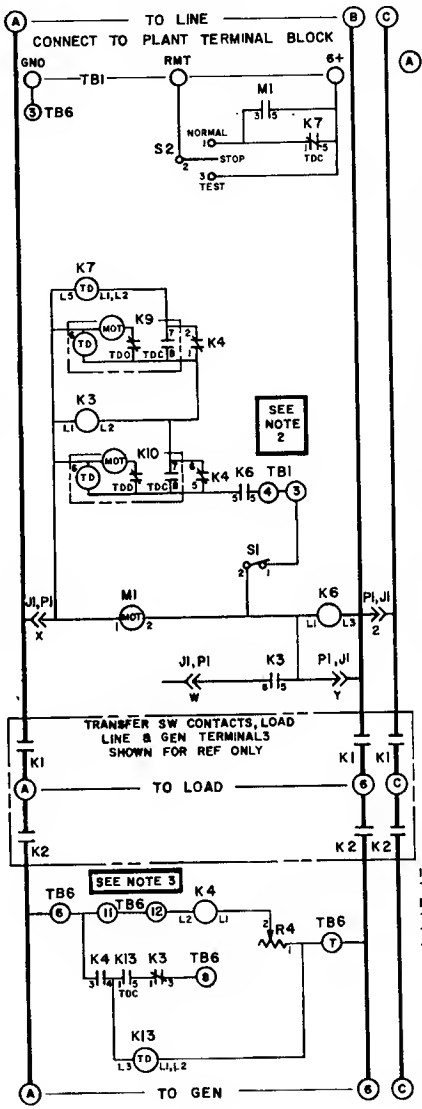


WIRING DIAGRAM
REAR VIEW OF SWINGING PANEL



NOTES:
1. ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION, UNLESS OTHERWISE NOTED
2. TO ADD AREA PROTECTION EQUIPMENT, OR REMOTE TEST TRANSFER SWITCH, REMOVE JUMPER & CONNECT TO T61-4 & 3
3. TO ACTIVATE TRANSFER-INHIBIT CIRCUIT, REMOVE JUMPER & CONNECT TO TB6-11 & 12
4. AFTER TEST, PLANT WILL RUN FOR DURATION OF TIME DELAYS
5. TO CONNECT RELAYS K7 & K13; FOR 208V; WIRE TO L2 & L3 FOR 240V; WIRE TO L1 & L3

SCHEMATIC



PARTS LIST					
REF. DES.	PART NO.	DWG SIZE	QTY	#=BULK	DESCRIPTION
K3	307-1113	B	1		RELAY-INTERPOSING LINE (208V)
	307-1083	B	1		RELAY-INTERPOSING LINE (240V)
K4	307-0664	C	1		RELAY-INTERPOSING GEN
K6	307-1114	B	1		RELAY-PHASE PROTECTION (208V)
	307-1081	B	1		RELAY-PHASE PROTECTION (240V)
K7	307-1138	B	1		RELAY-TIME DELAY ON STARTING
					1 TO 300 SEC ON DE-ENERGIZATION
	301-3313	A	1		MOUNTING PKG-RELAY PNL
K9	307-0724	B	1		RELAY-TIME DELAY ON STOPPING
					AFTER RETRANSFER (60Hz)
	307-0723	B	1		RELAY-TIME DELAY ON STOPPING
					AFTER RETRANSFER (50Hz)
	338-2316	A	1		LEAD ASSY
	338-2319	A	1		LEAD ASSY
K10	307-0724	B	1		RELAY-TO ON RETRANSFER (60Hz)
	307-0723	B	1		RELAY-TO ON RETRANSFER (50Hz)
	336-2309	A	1		LEAD ASSY
K13	307-1144	B	1		RELAY-TIME DELAY ON TRANSFER
					1 TO 300 SEC ON ENERGIZATION
	301-3313	A	1		MOUNTING PKG-RELAY PNL
	336-2310	A	1		LEAD ASSY
M1	307-1103	B	1		CLOCK-PLANT EXERCISER (60Hz)
	307-1103	B	1		CLOCK-PLANT EXERCISER (50Hz)
P1	323-0901	A	1		PLUG-LINE DISCONNECT
	301-3763	A	2		PLATE-PANEL INTERLOCK
	#303-0276	P	13"		HOSE
R4	304-0131	A	1		RESISTOR, 730Ω, 23W
S1	308-0069	P	1		SWITCH-TEST TRANSFER
S2	308-0138	A	1		SWITCH-SELECTOR
T81	332-1899	A	1		MARKER STRIP
T66	332-1469	A	1		MARKER STRIP
	301-3823	O	1		PANEL-SWINGING RELAY
	98-2793	D	1		SILKSCREEN-PANEL (FRONT)
	98-2786	O	1		SILKSCREEN-PANEL (REAR)
	405-1872	A	2		CLIP-DOOR
	326-0003	—	2		WASHER-FLAT
	818-0130	—	2		RIVET-DRIVE
	338-0923	E	1		WIRING HARNESS-MAIN
	301-2239	A	1		PLATE-COVER
	301-3842	A	1		PLATE-COVER

626-0075

CONTROL ACCESSORY GROUP 05
INCLUDES ALL STANDARD ITEMS, PLUS;
TO RETRANSFER 2-60 MIN
EXERCISER CLOCK
TO START 1-300 SEC
TO TRANSFER 1-300 SEC
TO STOP 2-60 MIN

-01	60Hz	240V
-02	50Hz	240V
-03	60Hz	208V
-04	50Hz	208V

REV	REVISION	BY	CHK	APPD	DATE
A	K8 WAS 307-0114	WB	JV		2-14-75

Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

MODEL NO: AT C, AT D

208/240V, 3 PH, 4W, 50/60Hz

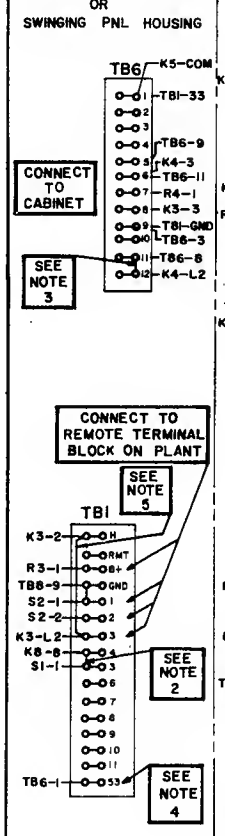
DATE 1-6-75 | DR. ADB | ENGR. JIM VANT | CKR. CDR

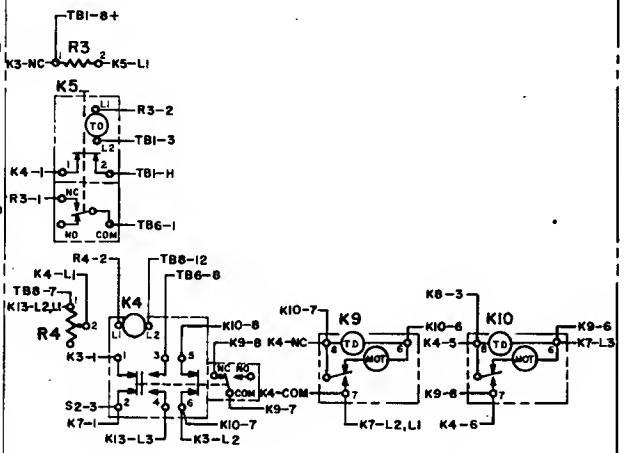
NAME: CONTROL ACCESS. PANEL (WIRING DIAGRAM)

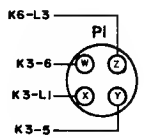
SEPIA FROM 626-0175 | DWG NO 626-0075 | DWG SIZE C

626-0175

INSIDE VIEW OF TRANSFER SW CABINET OR SWINGING PNL HOUSING



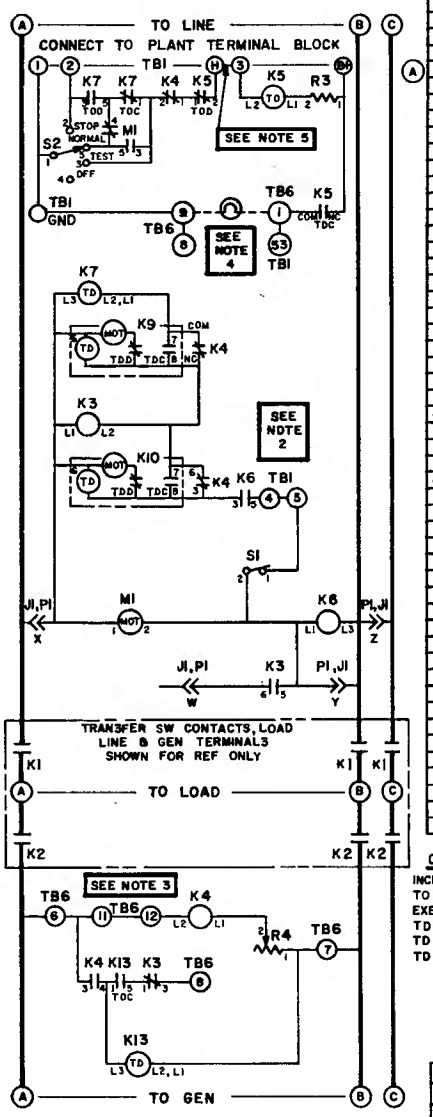




NOTES:

1. ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION, UNLESS OTHERWISE NOTED
2. TO ADD AREA PROTECTION EQUIPMENT, OR REMOTE TEST TRANSFER SWITCH, REMOVE JUMPER & CONNECT TO TBI-4 & 5
3. TO ACTIVATE TRANSFER-INHIBIT CIRCUIT, REMOVE JUMPER & CONNECT TO TB6-11 & 12
4. OVERCRANK SIGNAL, CONNECT TO TERMINAL 53 IN REMOTE ANNUNCIATOR
5. TO ADD TD PREHEAT, REMOVE JUMPER & CONNECT TO PREHEAT TO TERMINALS H, 8+ & 3 ON TBI
6. AFTER TEST, PLANT WILL RUN FOR DURATION OF TIME DELAYS
7. TO CONNECT RELAYS K7 & K13; FOR 208V; WIRE TO L2 & L3 FOR 240V; WIRE TO L1 & L3

SCHEMATIC



PARTS LIST					
REF. DES.	PART NO.	DWG SIZE	QTY	# BULK	DESCRIPTION
K3	307-1113	B	1		RELAY-INTERPOSING LINE (208V)
	307-1083	B	1		RELAY-INTERPOSING LINE (240V)
K4	307-0864	C	1		RELAY-INTERPOSING GEN
K3	320-0221	B	1		CRANKING LIMITER ASSY
K6	307-1114	B	1		RELAY-PHASE PRDTECTION (208V)
	307-1081	B	1		RELAY-PHASE PROTECTION (240V)
K7	307-1188	B	1		RELAY-TIME DELAY ON STARTING
					1 TO 300 SEC ON DE-ENERGIZATION
	301-3315	A	1		MOUNTING PKG-RELAY PNL
K9	307-1419	B	1		RELAY ASSY-TIME DELAY ON STOPPING
					AFTER RETRANSFER (60Hz)
					2 TO 60 MIN DN ENERGIZATION
	307-1418	B	1		RELAY ASSY-TIME DELAY ON STOPPING
					AFTER RETRANSFER (50Hz)
					2 TO 80 MIN ON ENERGIZATION
K10	307-0724	B	1		RELAY-TD ON RETRANSFER (60Hz)
	307-0723	B	1		RELAY-TD ON RETRANSFER (50Hz)
	336-2309	A	1		LEAD ASSY
K13	307-1144	B	1		RELAY-TIME DELAY ON TRANSFER
					1 TO 300 SEC ON ENERGIZATION
	301-3315	A	1		MOUNTING PKG-RELAY PNL
	336-2310	A	1		LEAD ASSY
MI	307-1103	B	1		CLOCK-PLANT EXERCISER (60Hz)
	307-1108	B	1		CLOCK-PLANT EXERCISER (50Hz)
PI	323-0901	A	1		PLUG-LINE OISCONNECT
	301-3765	A	2		PLATE-PANEL INTERLOCK
	H-503-0276	P	18"		HOSE
R3	383-0068	A	1		RESISTOR, 3.Ω., 10W
R4	304-0131	A	1		RESISTOR, 750.Ω., 23W
SI	308-0069	P	1		SWITCH-TEST TRANSFER
S2	308-0193	A	1		SWITCH-SELECTOR
	303-0078	—	1		KNOB
TBI	332-1899	A	1		MARKER STRIP
TB8	332-1489	A	1		MARKER STRIP
	301-3823	D	1		PANEL-SWINGING RELAY
	88-2793	D	1		SILKSCREEN-PANEL (FRONT)
	88-2798	D	1		SILKSCREEN-PANEL (REAR)
	405-1872	A	2		CLIP-DOOR
	326-0003	—	2		WASHER-FLAT
	818-0150	—	2		RIVET-DRIVE
	338-0921	E	1		WIRING HARNESS-MAIN
	301-2259	A	1		PLATE-COVER

626-0175

CONTROL ACCESSORY GROUP C5

INCLUDES ALL STANDARD ITEMS, PLUS;
TD RETRANSFER 2-80 MIN
EXERCISER CLOCK
TD START 1-300 SEC
TD TRANSFER 1-300 SEC
TD STOP 2-60 MIN

-01	60Hz	240V
-02	50Hz	240V
-03	60Hz	208V
-04	50Hz	208V

LET	REVISION	CKD	ENGR	DATE
A	K6 WAS 307-0114	WE	JV	2-17-75

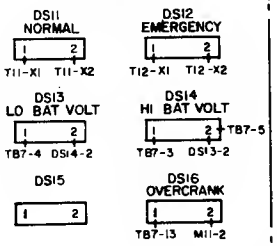
Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

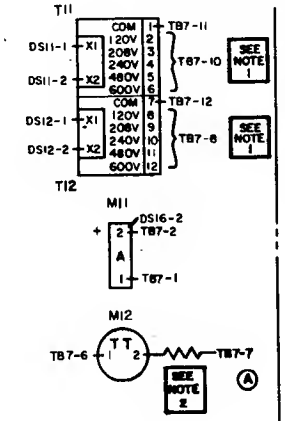
MODEL NO. AT E	DATE 1-6-75	DR. ADB	TRACE Jim Vint CKD. CDR
	NAME CONTROL ACCESS. PANEL (WIRING DIAGRAM)		
208/240V, 3 PH, 4W, 50/60 Hz	SEPIA FROM	DWG NO. 626-0175	DWG SIZE C

626-0164

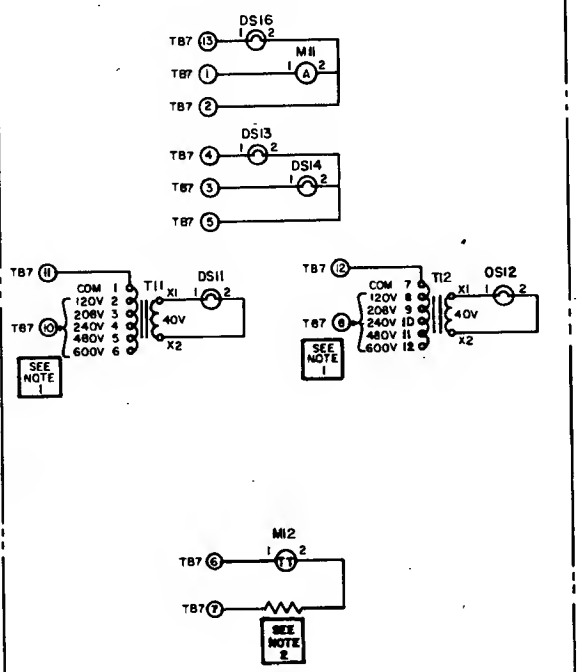
DWG SIZE C

REAR VIEW OF METER PANEL

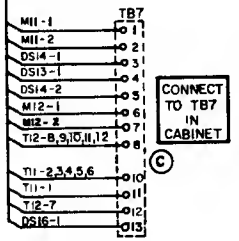




SCHEMATIC



LEFT SIDE OF CABINET



NOTE:
1. WIRE TRANSFORMER T11 & T12 AS FOLLOWS
   FOR 120V, CONNECT TB7-10 TO T11-2, TB7-8 TO T12-8
   FOR 208V, CONNECT TB7-10 TO T11-3, TB7-8 TO T12-9
   FOR 240V, CONNECT TB7-10 TO T11-4, TB7-8 TO T12-10
   FOR 480V, CONNECT TB7-10 TO T11-5, TB7-8 TO T12-11
   FOR 600V, CONNECT TB7-10 TO T11-6, TB7-8 TO T12-12
2. USE RESISTOR WITH RUNNING TIME METER ON 600V, 60Hz ONLY

PARTS LIST

REF. DES.	PART NO	DWG SIZE	QTY	DESCRIPTION
DSI1	322-0146	A	1	LAMP-NORMAL 56V
DSI2	322-0147	A	1	LAMP-EMERGENCY 56V
DSI3	322-0114	A	1	LAMP-LO BAT VOLT (14V) (AT D & E)
	322-0126	A	1	LAMP-LO BAT VOLT (28V) (AT C)
DSI4	322-0115	A	1	LAMP-HI BAT VOLT (14V) (AT D & E)
	322-0127	A	1	LAMP-HI BAT VOLT (28V) (AT C)
DSI5	322-0141	A	1	LENS & BEZEL ASSY
DSI6	322-0107	A	1	LAMP-OVERCRANK (14V)
MII	302-0807	A	1	AMMETER-BAT CHARGER 0-2 AMP
(B) MI2	302-0465	P	1	METER-RUNNING TIME(120V)(600V)(60Hz)
	302-0466	P	1	METER-RUNNING TIME (240V)(60Hz)
	302-0467	P	1	METER-RUNNING TIME (480V)(60Hz)
	304-0536	A	1	RESISTOR, 9000Ω 50W (600V)(60Hz) (USE WITH 302-0465 RTM ON 600V)
	302-0468	P	1	METER-RUNNING TIME (120V)(50Hz)
	302-0469	P	1	METER-RUNNING TIME (240V)(50Hz)
	302-0470	P	1	METER-RUNNING TIME (480V)(50Hz)
T11,12	315-0374	C	1	TRANSFORMER ASSY-STEPDOWN
	338-0883	C	1	HARNESS-METER
	338-0661	C	1	HARNESS-LAMPS (NORMAL & EMERGENCY)
	338-0659	B	1	HARNESS-LAMPS (BAT VOLTS)
	301-3505	C	1	PANEL-METER
	98-2413	D	1	SILKSCREEN-METER PANEL
	98-2445	A	1	LABEL-POWER SENTRY

626-0164

METER-LAMP COMBINATION: 16

CHARGE AMMETER
OVERCRANK LAMP (USE ON AT E ONLY)
RUNNING TIME METER

NORMAL & EMERGENCY LAMPS
BATTERY VOLTAGE LAMPS

THIS INFORMATION IS FOR MANUFACTURERS USE ONLY

HERTZ	VOLTAGE	AT C	AT D&E
60	120V	-01	-08
60	208-240V	-02	-09
60	480V	-03	-10
60	600V	-04	-11
50	120V	-05	-12
50	208-240V	-06	-13
50	480V	-07	-14

LET	REVISION	CKR	ENGR	DATE
D	ADDED 208V	WS	LL	8-4-75
C	MI2-2 WENT TO TB7-9	WS	JV	5-13-75
B	ADDED 600V TO MI2	CDR	JV	6-12-74
A	WAS TB7-9	CDR	JV	6-12-74

PROD REL JIM VINT 7-18-74
PROD REL LLL 8-8-75
MODEL AT C, AT D, AT E } SPEC B
(D) 120,208,240,480,600V 1 & 3PH 50/60Hz

Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
DATE 7-16-74 DR DFD ENGR JIM VINT CKR CDR
METER LAMP PANEL (WIRING DIAGRAM)
SEPIA FROM DWG NO 626-0164 DWG SIZE C

MODIFICATIONS

Modifications to the automatic transfer switches are described in this section. At the end of the section, instructions are also given for adding a module to the control accessory panel of groups 11 through 15. For calibration checks and adjustments of new modules or relays, etc., see the *ADJUSTMENTS* section.

WARNING **Throughout any modification, follow the instructions carefully. Otherwise, the automatic transfer switch and generator set present a serious shock hazard.**

CHANGING THREE-PHASE AT TO SINGLE-PHASE

To change a three-phase AT to a single-phase AT, use the following procedure:

1. Open the cabinet door of the automatic transfer switch.
2. Move the operation selector switch to "STOP" (on the engine control for two-wire starting, in cabinet for three-wire starting).
3. Disconnect the battery cables of the starting batteries.
4. Remove the AC line voltage from the automatic transfer switch.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

5. Remove the control disconnect plug and open the control accessory panel.
6. *400 ampere AT only:* Remove one screw from the inside center support for the left cabinet door and open.
7. Remove generator, line and load connections from the transfer switch terminal C.
8. Connect single-phase generator, line, and load connections to respective terminals A and B. Make sure single-phase voltage matches transfer switch voltage.

CAUTION **Incorrect voltage may damage transfer switch.**

9. *Control accessory groups 11 through 15:* For control accessory panels with plug-in modules, remove undervoltage sensors 2 and 3 (if equipped). Insert 300-0927 bypass plug modules into the module openings 2 and 3.

If a different generator set is used with a different voltage starting system, see *Changing Control Accessory Panel DC System Voltage.*

Control accessory groups 51 through 55: When changing phase of an AT with one of these control accessory panels, replace the panel with one matching the single-phase voltage. See *Changing Control Accessory Panel.*

10. Remove the one screw on top and one screw on bottom from inside the meter-lamp panel flange.
11. Swing meter-lamp panel outward.
12. If the meter-lamp panel is three-phase only, remove the panel as described under *Changing Meter-Lamp Panel.* If the meter-lamp panel is a single- or single- and three-phase panel, rewire the connections on transformers T11 and T12 (if equipped). See Figure 1.
    a. For 120 volts, reconnect lead from TB7-10 to T11-2, and reconnect lead from TB7-8 to T12-8.
    b. For 240 volts, reconnect lead from TB7-10 to T11-4, and reconnect lead from TB7-8 to T12-10.

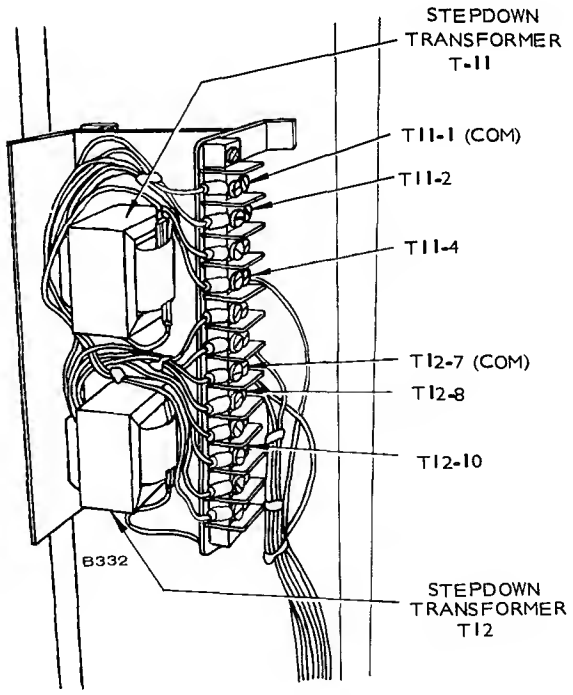


FIGURE 1. STEPDOWN TRANSFORMERS T11 AND T12 ON METER-LAMP PANEL

13. Close the meter-lamp panel and secure the top and bottom with two screws removed in Step 10.
14. *400 ampere AT only:* Close the left cabinet door and secure to inside center support with one screw removed in Step 6.
15. Close the control accessory panel and reconnect the control panel disconnect plug.
16. Restore AC line voltage to the AT.
17. Reconnect the starting batteries.
18. Move the operation selector to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
19. Close the cabinet door.

CHANGING METER-LAMP PANEL

To change a meter lamp panel in an automatic transfer switch, use the following procedure:

1. Open the front door of the cabinet.
2. Move operation selector switch to "STOP" (located in cabinet for three-wire starting, on engine control for two-wire starting).
3. Disconnect the starting battery.
4. Remove the AC line voltage from the automatic transfer switch.

WARNING **Be sure to remove AC line voltage from the automatic transfer switch. Otherwise, the transfer switch has high voltages and presents a serious shock hazard.**

5. Remove the twist-lock disconnect plug and pull control accessory panel open.
6. *400 ampere AT only:* Remove the one screw from the inside center support for the left cabinet door and open.
7. Remove the one screw on top and one screw on bottom from inside the meter-lamp panel flange.
8. Swing the meter-lamp panel outward.
9. Disconnect the meter-lamp panel wire leads from TB7 and TB8 (if present). See Figure 2.
10. Remove the four nuts and washers holding the meter-lamp panel on the left wall of the cabinet and remove the meter-lamp panel.
11. Mount the new meter-lamp panel on the cabinet using the same four nuts and washers.

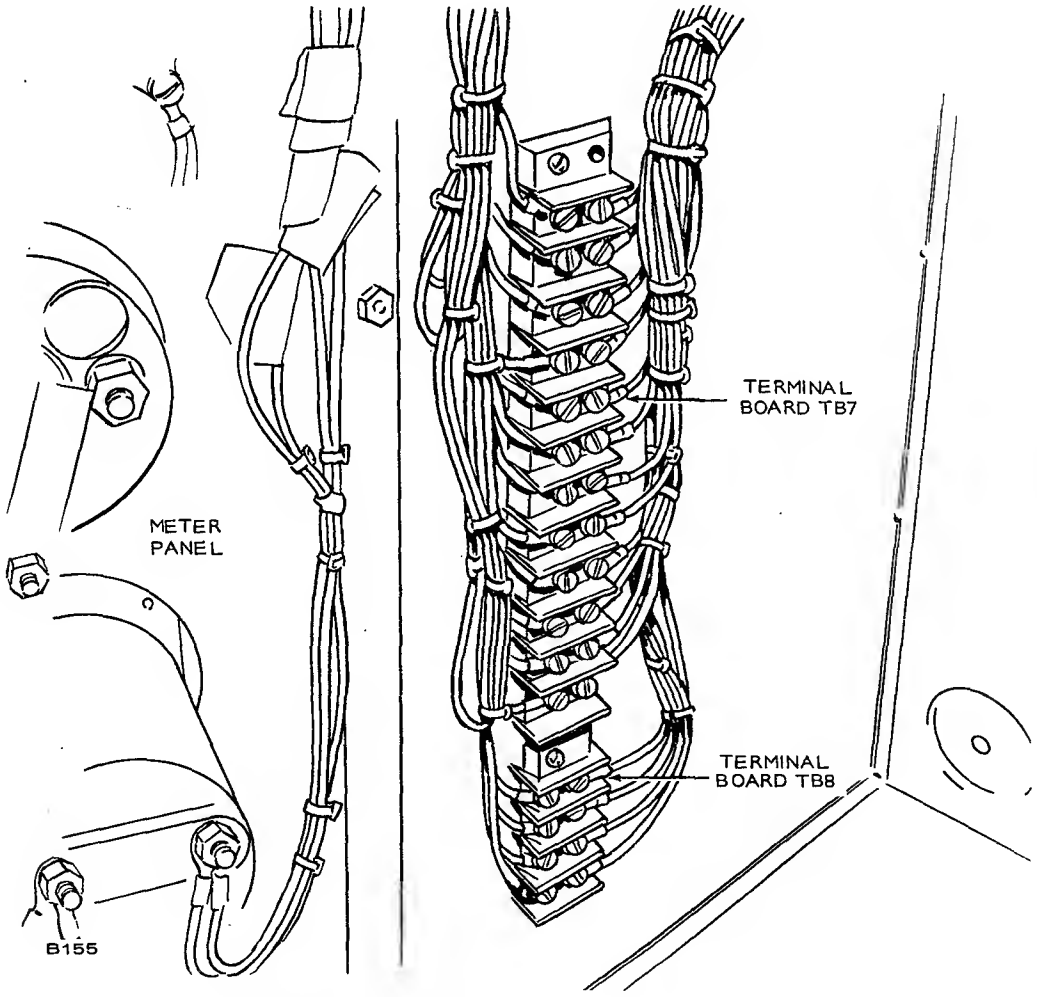


FIGURE 2. TERMINAL BOARD FOR METER-LAMP PANEL WIRE CONNECTIONS

12. Connect the wire leads as marked, from the meter-lamp panel wiring harness to terminal blocks TB7 and TB8 (if present).
13. Close the meter-lamp panel and secure the top and bottom with the two screws from the other meter-lamp panel (from Step 7).
14. *400 ampere AT only:* Shut the left cabinet door. Secure the door to the cabinet's center support with the one screw removed in Step 6.
15. Close the control accessory panel and reconnect the twist-lock disconnect plug.
16. Restore AC line voltage to the automatic transfer switch.
17. Move the operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
18. Reconnect starting battery.
19. Close cabinet door.

CHANGING CONTROL ACCESSORY PANEL

Panel Groups 11 Through 15

1. Open automatic transfer switch cabinet door.
2. Move operation selector switch to "STOP" (on engine control for two-wire starting, in cabinet for three-wire starting).
3. Remove AC line voltage from the automatic transfer switch.
4. Disconnect the starting batteries.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

5. Remove the twist-lock disconnect plug and open the control accessory panel.
6. Remove external wires from TB1, TB2, TB6 and TB9 (if all present), then remove these terminal blocks from mounting. See Figure 3.

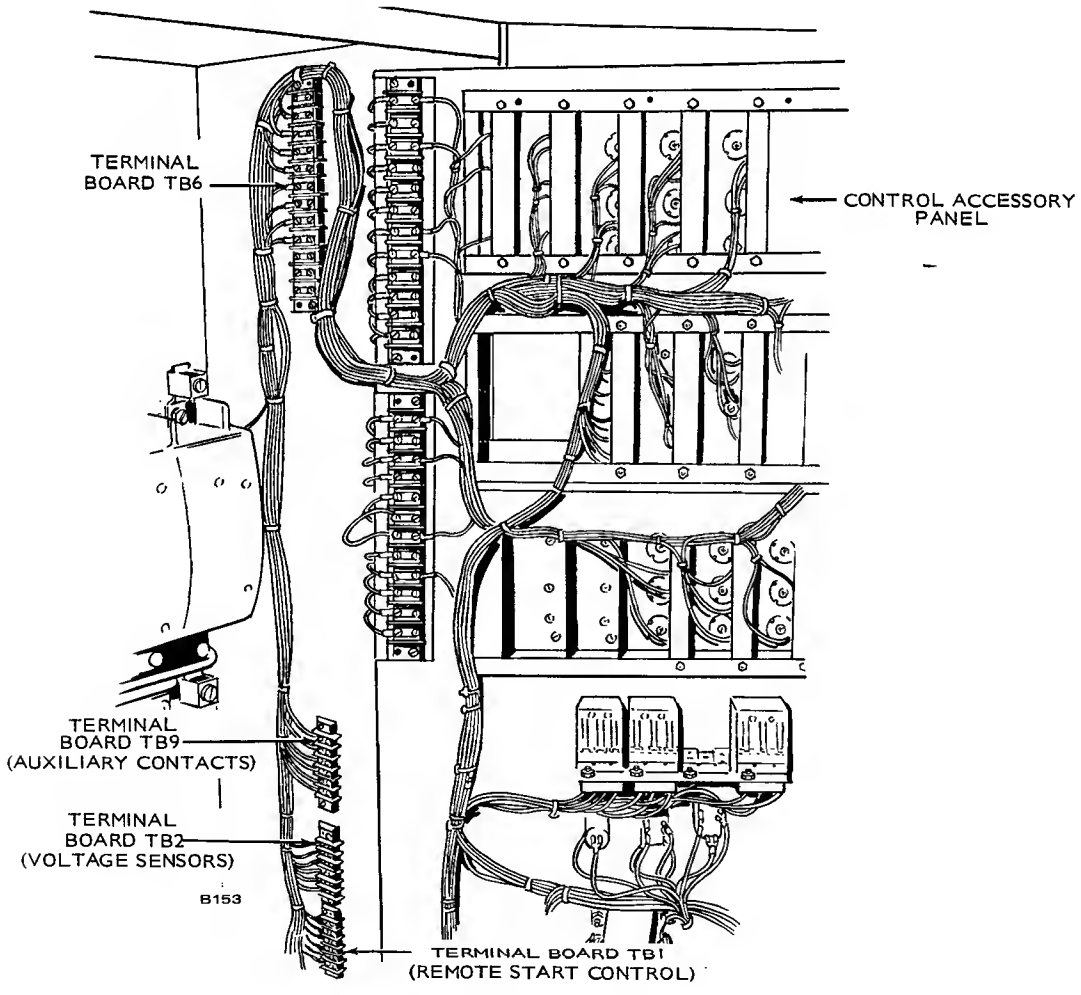


FIGURE 3. TERMINAL BOARD CONNECTIONS FOR CONTROL ACCESSORY PANEL

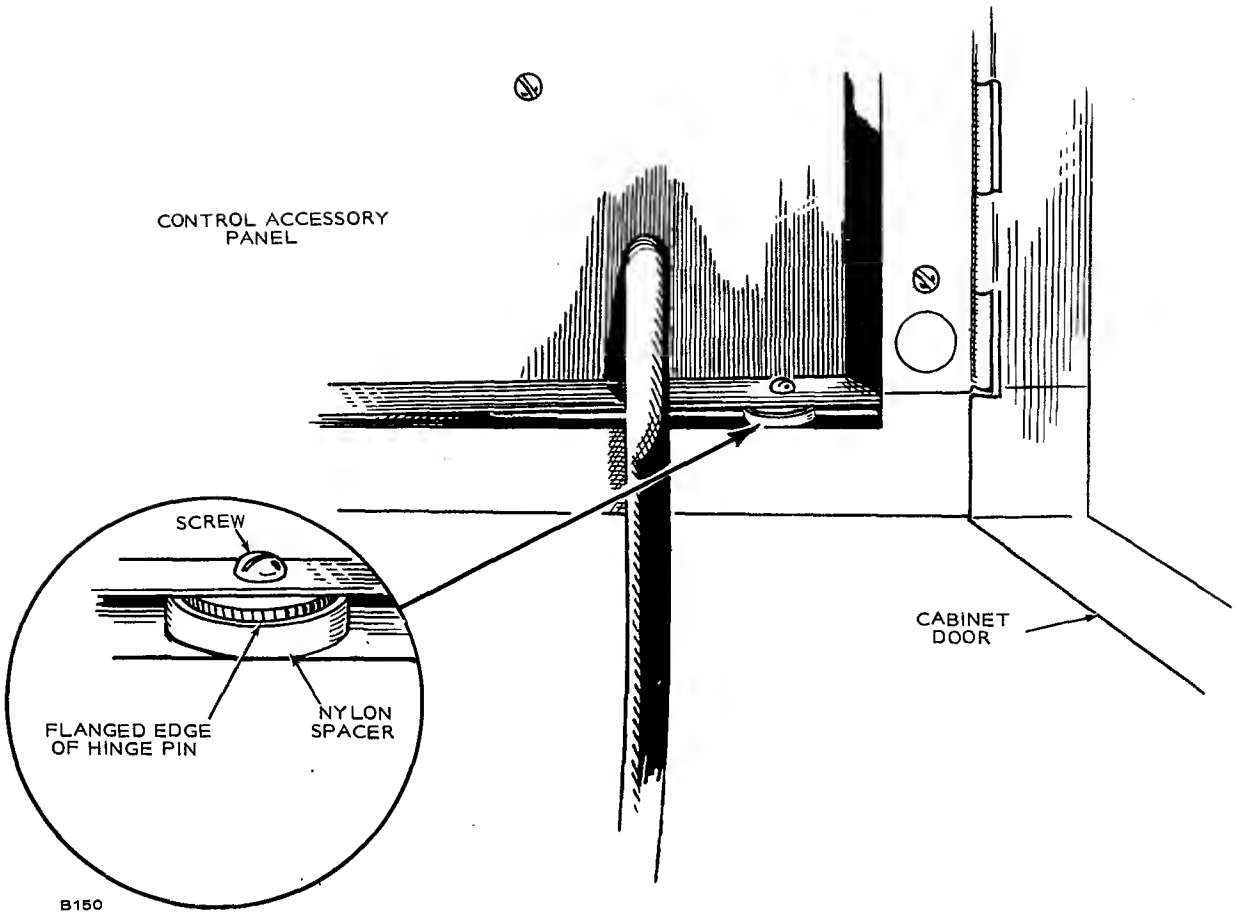


FIGURE 4. BOTTOM HINGE PIN FOR CONTROL ACCESSORY PANEL

7. Hold the flange edge of the control accessory panel's bottom hinge pin with a needle-nose pliers (just above nylon spacer) and remove screw from pin with a screwdriver. The pliers prevent the pin from turning when loosening the screw (Figure 4).

WARNING **When screw is removed, control accessory panel is loose on bottom. Have someone holding the panel during removal procedures to prevent personal injury.**

8. Carefully pull outward on bottom of control accessory panel until it clears cabinet.
9. Lower control accessory panel from cabinet. Top hinge pin will come out with control accessory panel.
10. Remove the top hinge pin from control accessory panel and install on new panel if required.
11. Lift up new control accessory panel into cabinet, carefully engaging top hinge pin.
12. Center the hole on the bottom control panel flange over hinge pin.
13. Insert the screw in bottom hinge pin and tighten with screwdriver and pliers.
14. Install the terminal boards (from new control accessory panel) on the wall of the cabinet, using #6-32 screws. TB2 mounts just above TB1 remote terminal block, TB9 just above TB2, and TB6 in the upper right side.
15. Connect loose wire leads to terminal blocks as marked.
16. If an area protection circuit or remote test switch is used, remove the jumper between terminals TB1-4 and -5, and connect the wire leads from the equipment.
17. If the AC voltage of the new control accessory panel is different, see *Changing Control Accessory Panel AC Voltage*.
18. If the DC system voltage and number wire start is different on the new control panel, see *Changing Control Accessory Panel DC System Voltage* and/or *Three to Two Wire Start Conversion (12 Volts)*, or *Two to Three Wire Start Conversion (12 Volts)*.
19. For external alarms or signal circuits of the battery voltage sensors, connect lead wires to TB2. These contacts are rated 2 amperes for 12 volts DC or 120 volts AC.
20. Close the control accessory panel and reconnect the twist-lock disconnect plug.

21. Restore AC line voltage to the automatic transfer switch.
22. Reconnect the starting batteries.
23. Move operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
24. Close the cabinet door.

Panel Groups 51 Through 55

The new control accessory panel installed must match AC system voltage and start control (2- or 3-wire) of panel removed.

1. Open automatic transfer switch cabinet door.
2. Move the operation selector switch to "STOP" (on engine control for two-wire starting, in AT cabinet for three-wire starting).
3. Disconnect the starting batteries.
4. Remove AC voltage from the automatic transfer switch.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

5. Remove the twist-lock disconnect plug and open control accessory panel.
6. Remove the external wires from TB1 and TB6, then remove the terminal blocks from mounting. See Figure 3.
7. Hold the flange edge of the control accessory panel's bottom hinge pin with a needle-nose pliers (just above nylon spacer) and remove screw from pin with a screwdriver. The pliers prevent the pin from turning when loosening the screw (Figure 4).

WARNING **When screw is removed, control accessory panel is loose on bottom. Have someone holding the panel during removal procedures to prevent personal injury.**

8. Carefully pull outward on bottom of control accessory panel until it clears cabinet.
9. Lower control accessory panel from cabinet. Top hinge pin will come out with control accessory panel.
10. Remove the top hinge pin from control panel and install on new panel if required.
11. Lift up new control panel into cabinet, carefully engaging top hinge pin.
12. Center the hole on the bottom control panel flange over the hinge pin.
13. Insert the screw in bottom hinge pin and tighten with screwdriver and pliers.
14. Install terminal boards TB1 and TB6 (from new control accessory panel). Connect loose wires in cabinet to terminal blocks as marked.
15. If an area protection circuit or a remote test switch is used, remove the jumper between terminals TB1-4 and -5, and connect the wire leads from the equipment.
16. Close the control accessory panel and reconnect the twist-lock disconnect plug.
17. Set the time delays following instructions in the *ADJUSTMENTS* section.
18. Restore AC line voltage to the automatic transfer switch.
19. Reconnect the starting batteries.
20. Move the operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
21. Close cabinet door of automatic transfer switch.

CHANGING CONTROL ACCESSORY PANEL AC SYSTEM VOLTAGE

This modification applies only to control accessory panels in groups 11 through 15.

If the control accessory panel has been changed and its nominal voltage differs from the automatic transfer switch, use the following procedure:

1. Open automatic transfer switch cabinet door.
2. Move the operation selector switch to "STOP" (on engine control for two-wire starting, in AT cabinet for three-wire starting).
3. Disconnect the starting batteries.
4. Remove AC line voltage from the automatic transfer switch.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

5. Remove the twist-lock disconnect plug and control accessory panel.
6. Rewire the stepdown transformers T2, T3, T4, and T5 using the wiring diagram furnished with the control accessory panel. Change the wire lead connections on the right side (facing panel rear) of the terminal strip for the transformers. See Figure 5.
7. Rewire battery charger transformer T1 so the wire from F1-2 and T1-H5 (COM) go to the appropriate connections on the transformer for the nominal AC voltage (Figure 6). See the wiring diagram for the correct connections.
8. Close the control accessory panel.
9. Reconnect the twist-lock disconnect plug.
10. Restore AC line voltage to the automatic transfer switch.
11. Reconnect the starting batteries.

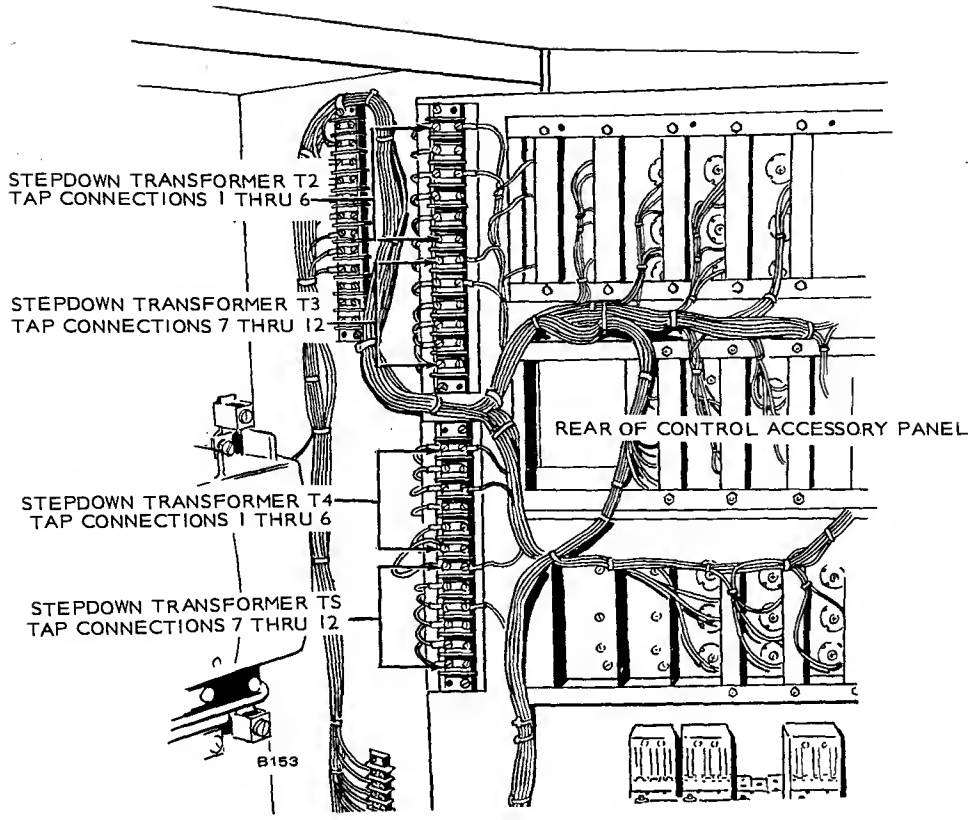


FIGURE 5. AC VOLTAGE CONNECTIONS FOR STEPDOWN TRANSFORMERS

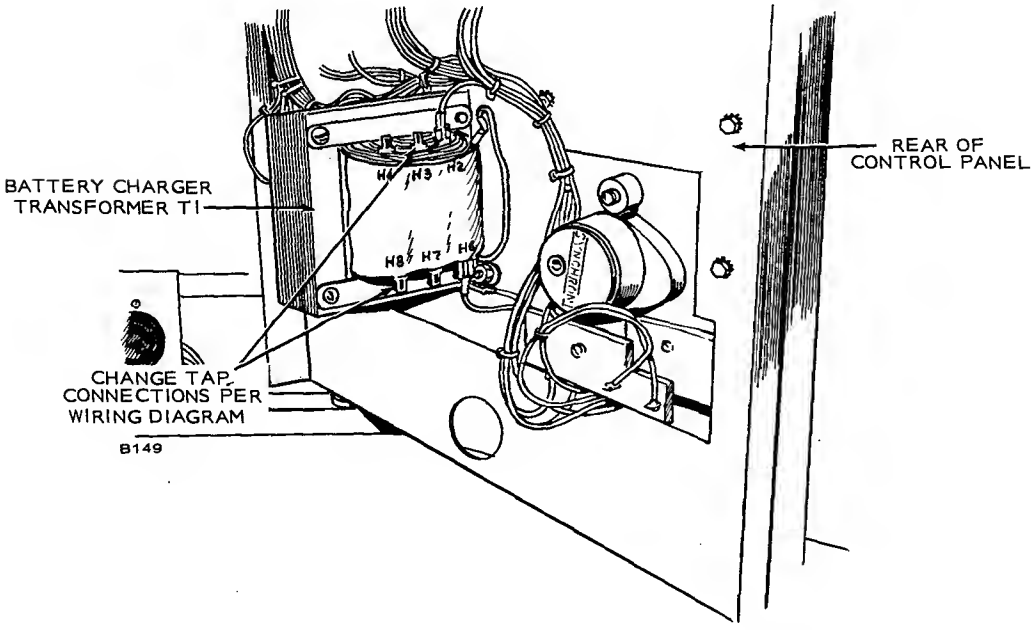


FIGURE 6. BATTERY CHARGER TRANSFORMER AC CONNECTIONS

12. Move the operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
13. Close the cabinet door.

CHANGING CONTROL ACCESSORY PANEL DC SYSTEM VOLTAGE

This modification applies only to control accessory panels in groups 11 through 15.

From 24 to 12 Volts

1. Open the automatic transfer switch cabinet door.
2. Move operation selector switch to "STOP" (on engine control for two-wire starting, in AT cabinet for three-wire starting).
3. Disconnect the starting batteries.
4. Remove AC line voltage from the automatic transfer switch.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

5. Remove the twist-lock disconnect plug and open the control accessory panel.
6. Remove the wire lead from transformer T1 terminal T1-X3 and connect to terminal T1-X2 (Figure 7).
7. Remove the wire lead from resistor R1 terminal R1-3 and connect to terminal R1-2. See Figure 8.
8. Remove the 24-volt battery charger module 6 (number 300-0794) and replace with the 12-volt module, number 300-0793.
9. Remove the 24- to 12-volt converter module 5 (number 300-0848) and replace with the 12-volt module, number 300-0847.
10. Remove the 24-volt, start-stop time delay module 7 (number 300-0922) and replace with the 12-volt time delay module 300-0921.
11. If module 10 is a 24-volt battery voltage sensor, number 300-0797, remove and replace it with a 12-volt, number 300-0796 sensor module.
12. *400 ampere AT only:* Remove the one screw from inside center support for left cabinet door and open door.
13. Remove the one screw on top and one screw on bottom from inside meter-lamp panel flange.
14. Swing the meter-lamp panel outward.
15. Remove "LO BAT VOLT" lamps DS13 and "HI BAT VOLT" lamp DS14 from the meter-lamp panel and replace with 322-0114 and 322-0115 lamps respectively.
16. Close the meter-lamp panel and secure the top and bottom with the two screws.
17. *400 ampere AT only:* Close the left cabinet door. Secure the door to the cabinet center support with the screw removed in Step 12.

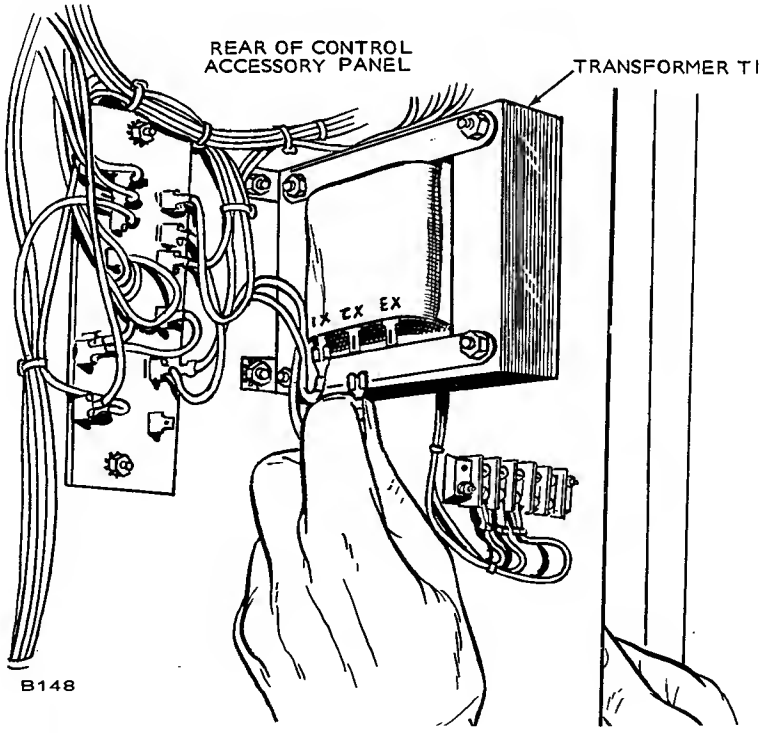


FIGURE 7. BATTERY CHARGER TRANSFORMER DC CONNECTIONS

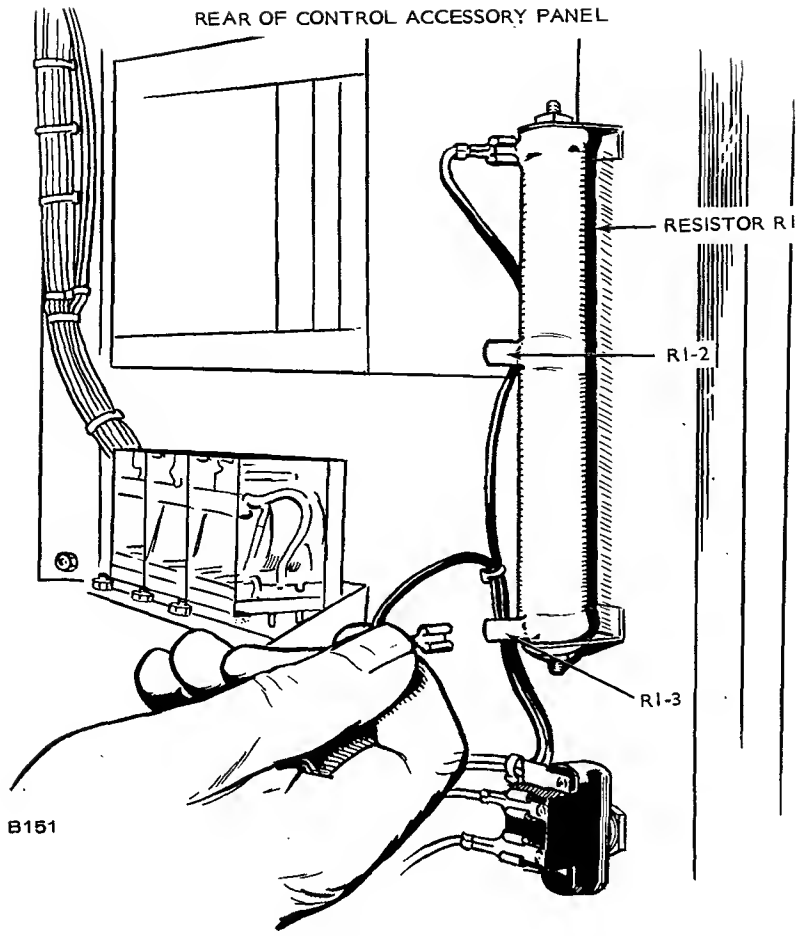


FIGURE 8. CHANGING RESISTOR R1 TAP SETTING

18. Close the control accessory panel and reconnect the twist-lock disconnect plug.

If starting is changed from two- to three-wire starting, proceed to that modification described in this section.

19. Connect a 12-volt battery and restore AC line voltage to the automatic transfer switch.
20. Move the operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
21. Close the cabinet door.

From 12 to 24 Volts

1. Open the automatic transfer switch cabinet door.
2. Move operation selector switch to "STOP" (on engine control for two-wire starting, in AT cabinet for three-wire starting).
3. Disconnect the starting batteries.
4. Remove AC line voltage from the automatic transfer switch.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

5. Remove the twist-lock disconnect plug and open the control accessory panel.
6. Remove the wire lead from transformer T1 terminal T1-X2 and connect to terminal T1-X3 (Figure 7).
7. Remove the wire lead from resistor R1 terminal R1-2 and connect to terminal R1-3. See Figure 8.
8. Remove the 12-volt battery charger module 6 (number 300-0793) and replace with the 24-volt module, number 300-0794.
9. Remove the 12-volt module 5 (number 300-0847) and replace with the 24- to 12-volt converter module, number 300-0848.
10. Remove the 12-volt, start-stop time delay module 7 (number 300-0921) and replace with the 24-volt time delay module 300-0922.
11. If module 9 is a 2 to 3 wire converter, number 300-0926, remove and replace with a blank (spare) 300-0937 module.
12. If module 10 is a 12-volt battery voltage sensor, number 300-0796, remove and replace it with a 24-volt, number 300-0797 sensor module.
13. *400 ampere AT only:* Remove the one screw from inside center support for left cabinet door and open door.

3. Remove AC line voltage from the automatic transfer switch.

WARNING **Be sure to remove AC line voltage from the automatic transfer switch and disable the generator set. Otherwise, the automatic transfer switch presents a serious shock hazard.**

4. Remove the twist-lock disconnect plug and open control accessory panel.
5. Install 332-1276 keying plug(s) in the slot(s) of the printed circuit board receptacle as needed. Figure 9 shows how a keying plug is inserted into the receptacle. See a control accessory panel wiring diagram showing location of the keying plug(s) for that particular module.
6. Insert the new module in the control accessory panel.
7. Restore AC line voltage to the automatic transfer switch.
8. Close the control accessory panel and reconnect the disconnect plug.
9. Move the operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
10. Close cabinet door.

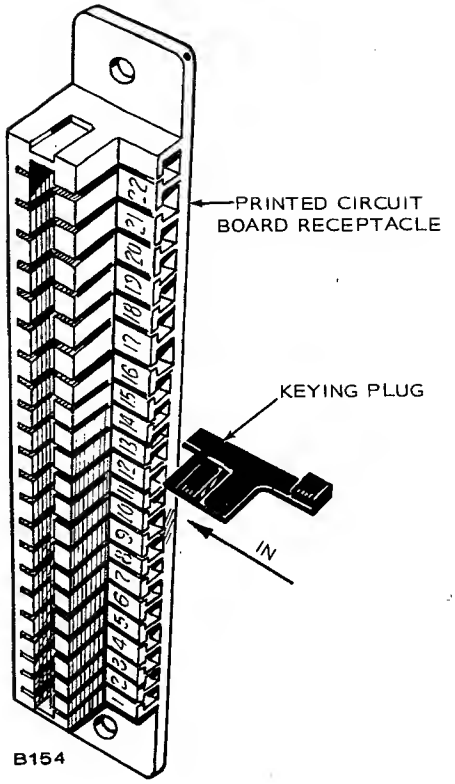


FIGURE 9. INSTALLATION OF KEYING PLUG

14. Remove one screw on top and one screw on bottom from inside meter-lamp panel flange.
15. Swing the meter-lamp panel outward.
16. Remove "LO BAT VOLT" lamp DS13 and "HI BAT VOLT" lamp DS14 from the meter-lamp panel and replace with 322-0126 and 322-0127 lamps respectively.
17. Close the meter-lamp panel and secure the top and bottom with the two screws.
18. *400 ampere AT only:* Close the left cabinet door. Secure the door to the cabinet center support with the one screw removed in Step 13.
19. Close the control accessory panel and reconnect the twist-lock disconnect plug.

If starting is changed from three to two-wire starting, proceed to that modification in this section.

20. Connect a 24-volt battery and restore AC line voltage to the automatic transfer switch.
21. Move the operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
22. Close the cabinet door.

TWO TO THREE WIRE START CONVERSION (12 VOLTS)

This procedure applies only to control accessory panels in groups 11 through 15.

To convert a two-wire start control automatic transfer switch to three-wire start, use the following procedure:

1. Move the operation selector switch on the engine control to "STOP."
2. Disconnect the starting batteries.
3. Remove AC line voltage from the automatic transfer switch.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

4. Open the automatic transfer switch cabinet door.
5. Remove the remote start wire leads between the engine control remote terminal block and the automatic transfer switch terminal block TB1.
6. Remove the 300-0937 blank (spare) module 9 and replace with a 300-0926 2 to 3 wire converter module.
7. Check battery voltage (battery must be a 12-volt unit). If DC system was 24 volts, make the conversion *Changing Control Accessory Panel DC System Voltage* described in this section.
8. Connect automatic transfer switch to terminals TB1-B+, -1, and -3 to the three-wire start engine control.
9. Restore AC line voltage to the automatic transfer switch.
10. Connect the starting batteries.
11. Move the operation selector switch on the 2 to 3 wire converter module 9 to "NORMAL."
12. Close the cabinet door.

THREE TO TWO WIRE START CONVERSION (12 VOLTS)

This procedure applies only to control accessory panels in groups 11 through 15.

For a conversion from three-wire, 12-volt system to a two-wire, 24-volt system, perform the *Changing Control Accessory Panel DC System Voltage* first, then proceed to the following:

1. Open the automatic transfer switch cabinet door.
2. Move the operation selector switch on 2 to 3 wire converter module 9 to "STOP."
3. Disconnect the starting batteries.
4. Remove AC line voltage from the automatic transfer switch.

WARNING **Failure to remove AC power from the automatic transfer switch and to disable the generator set presents a serious shock hazard during this modification.**

5. Remove the wire leads between the engine control remote terminal block and the automatic transfer switch remote terminal block TB1.
6. Remove 300-0926 2 to 3 wire converter module 9 and replace it with a 300-0937 blank (spare) module.
7. Connect automatic transfer switch terminals TB1-B+, -RMT and -GND to the 2-wire start engine control.
8. Restore AC line voltage to the automatic transfer switch.
9. Connect the starting batteries.
10. Move the operation selector switch on the engine control to "RMT."
11. Close the cabinet door.

ADDING MODULE IN CONTROL ACCESSORY PANEL

The following procedure applies only to control accessory groups 11 through 15.

Whenever adding a plug-in module in the control accessory panel where there previously was a blank (spare), be sure to use the following procedure:

1. Open the cabinet door.
2. Move operation selector switch to "STOP" (on engine control for two-wire starting, in AT cabinet for three-wire starting) and disconnect starting battery.

13. Restore AC line voltage to the automatic transfer switch.
14. Move operation selector switch to "NORMAL" (in cabinet for three-wire starting) or "RMT" (on engine control for two-wire starting), whichever applies.
15. Reconnect starting battery.
16. Close cabinet door.

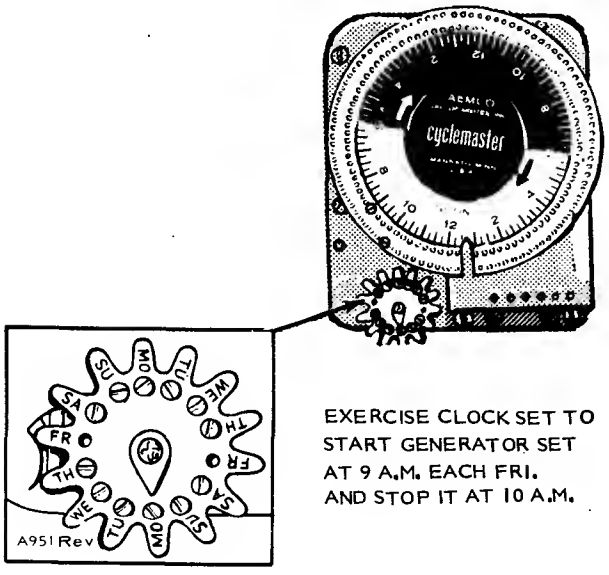
EXERCISER CLOCK

1. Open the cabinet door of the automatic transfer switch.
2. Move the operation selector switch (on engine control for two-wire starting, in AT cabinet for three-wire starting) to "STOP."
3. Install a trip pin (left-hand thread) in the inside row of holes on the large dial for the time of day you want the generator set to start. See Figure 11.
4. Place a trip pin in the outside row of holes on the large dial to stop the generator set.

Onan recommends settings which operate the generator set for at least 30 minutes each week. Exercising for one long period is better than several short periods.

5. Install a trip pin in the small spoked wheel for every day *no exercise* is desired.
6. Rotate the large dial clockwise until the correct time is correctly aligned with the time pointer.
7. Align the small spoked wheel with the correct day at its pointer.

Sixteen trip pins are supplied with the clock. Store unused pins on the time pointer bracket.



EXERCISE CLOCK SET TO START GENERATOR SET AT 9 A.M. EACH FRI. AND STOP IT AT 10 A.M.

FIGURE 11. EXERCISER CLOCK

8. Move the operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
9. Close the cabinet door.

TIME DELAYS

For adjustments of the auxiliary transfer and retransfer time delay assembly, see the following instructions. For the other time delays, follow instructions under *Control Accessory Groups 11 Through 15* for the modular-type panels, *Control Accessory Groups 51 Through 55* for the relay-type panels.

Auxiliary Transfer and Retransfer Time Delay Assembly

Both auxiliary transfer and retransfer time delays can provide 1 to 300 seconds of no power to loads during transfer or retransfer of transfer switch operation. For adjustment of either time delay, use the following procedure:

1. Open cabinet door of automatic transfer switch.
2. Move the operation selector switch to "STOP" (in AT cabinet for three-wire starting, on engine control for two-wire starting) and disconnect starting battery.
3. Remove AC line power to the automatic transfer switch.

WARNING **Be sure to remove AC line voltage from the automatic transfer switch and disable the generator set. Otherwise, the automatic transfer switch presents a serious shock hazard.**

4. *400 ampere AT only:* Remove the one screw from the inside center support for the left cabinet door and open.
5. Remove the two screws from the meter lamp panel's inside flange and open meter-lamp panel.
6. Locate the time delay assembly below the transfer switch on rear panel of cabinet. Transfer time delay K11 (for line side) is located on the left, time delay K12 (for generator side) is on the right.
7. Turn the knob (on the time delay to be adjusted) clockwise to increase delay (increments marked on knob), counterclockwise to decrease time delay.
8. Close the meter-lamp panel and secure with two screws.
9. *400 ampere AT only:* Close the left cabinet door and secure with screw to cabinet center support.
10. Restore AC line voltage to automatic transfer switch.
11. Move the operation selector switch to "NORMAL" (in cabinet for three-wire starting) or "RMT" (on engine control for two-wire starting), whichever applies.
12. Reconnect the starting battery.
13. Close the cabinet door.

ADJUSTMENTS

See the *TRANSFER SWITCH* section for maintenance, repair or adjustments of transfer switch mechanism.

LATCH AND LATCH PIN ADJUSTMENT

If the control accessory panel will not close because the latch is above or below the latch pin (on meter panel for 30 through 225 ampere AT's, on cabinet center support for 400 ampere AT's), perform the following:

1. Open cabinet door of automatic transfer switch.
2. Move operation selector switch to "STOP" (in AT cabinet for three-wire starting, on engine control for two-wire starting) and disconnect starting battery.
3. Remove AC line voltage from the automatic transfer switch.

WARNING **Be sure to remove AC line voltage from the automatic transfer switch and disable the generator set. Otherwise, the automatic transfer switch presents a serious shock hazard.**

4. Remove the twist-lock disconnect plug.
5. Completely open the control accessory panel.
6. *400 ampere AT only:* Remove the one screw from the inside center support for the left cabinet door and open. Proceed to Step 8.
7. Remove the one screw on top and one screw on bottom from inside meter panel flange. Open meter panel.
8. Loosen the latch pin on the edge of the meter panel or cabinet center support, whichever applies, and move the latch pin up or down in the slot as necessary (Figure 10). Then tighten.
9. *400 ampere AT only:* Close the left cabinet door and reinstall the one screw. Proceed to Step 11.
10. Close the meter panel and reinstall the two screws removed in Step 7.
11. Close the control accessory panel. If more adjustment is necessary, repeat Steps 5 through 11.
12. Reconnect the twist-lock disconnect plug.

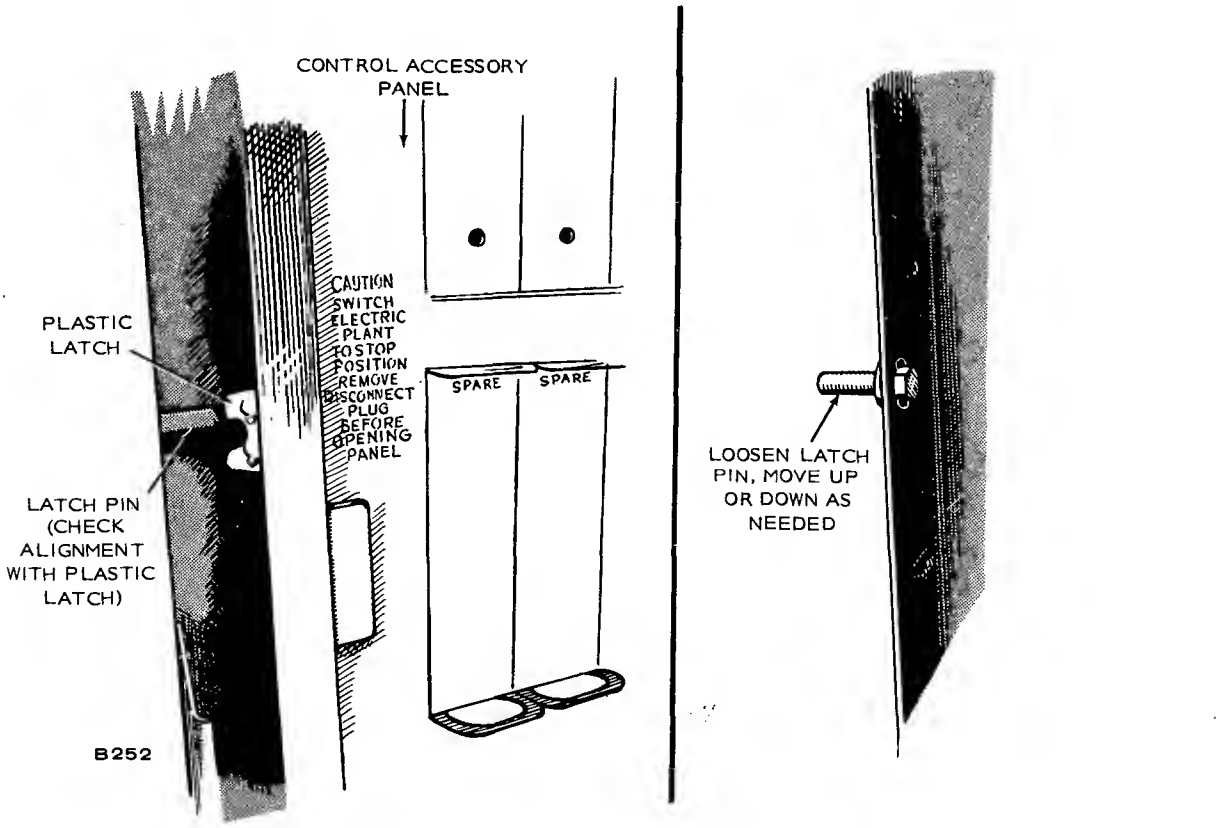


FIGURE 10. ADJUSTMENT OF LATCH PIN

Control Accessory Groups 11 Through 15

Start-Stop Time Delay: Time delay for start is factory adjusted for 2 to 3 seconds. Time delay on stop is factory adjusted for 4.5 to 5 minutes. If other times are desired, use the following procedure:

1. Open the cabinet door of automatic transfer switch.
2. Move selector switch to "WITH LOAD."
3. Move test transfer switch to "TEST."
4. With a stopwatch or watch with a second hand, measure the time until the generator set starts cranking.
5. Insert a small screwdriver through "START" hole in front panel of start-stop time delay module 7. Turn "START" potentiometer clockwise to increase start time delay or counterclockwise to decrease start time delay. Make adjustments in small increments.
6. Move test transfer switch to "NORMAL."
7. Measure time until generator set begins to shut down.
8. Turn "STOP" potentiometer with the small screwdriver clockwise to increase the stop time delay or counterclockwise to decrease the stop time delay. Make adjustments in small increments.
9. Repeat Steps 2 through 8 until desired delay times are obtained.
10. Move selector switch to desired position, "WITHOUT LOAD" or "WITH LOAD."
11. Close the cabinet door.

Transfer Time Delay: For adjustment or change of the time delay for transfer (transfer of the load to the generator set) from the standard setting, two to three seconds, use the following procedure:

1. Open cabinet door of automatic transfer switch.
2. Move operation selector switch to "STOP" (on engine control for two-wire starting, in AT cabinet for three-wire starting).
3. Move selector switch to "WITH LOAD."
4. Remove the twist-lock disconnect plug.
5. Open the control accessory panel.
6. Locate generator interposing relay K4 (Figure 12).
7. Reconnect the twist-lock disconnect plug with the control accessory panel open.

WARNING **Rear of the control accessory panel and transfer switch are energized. Do not touch due to serious shock hazard!**

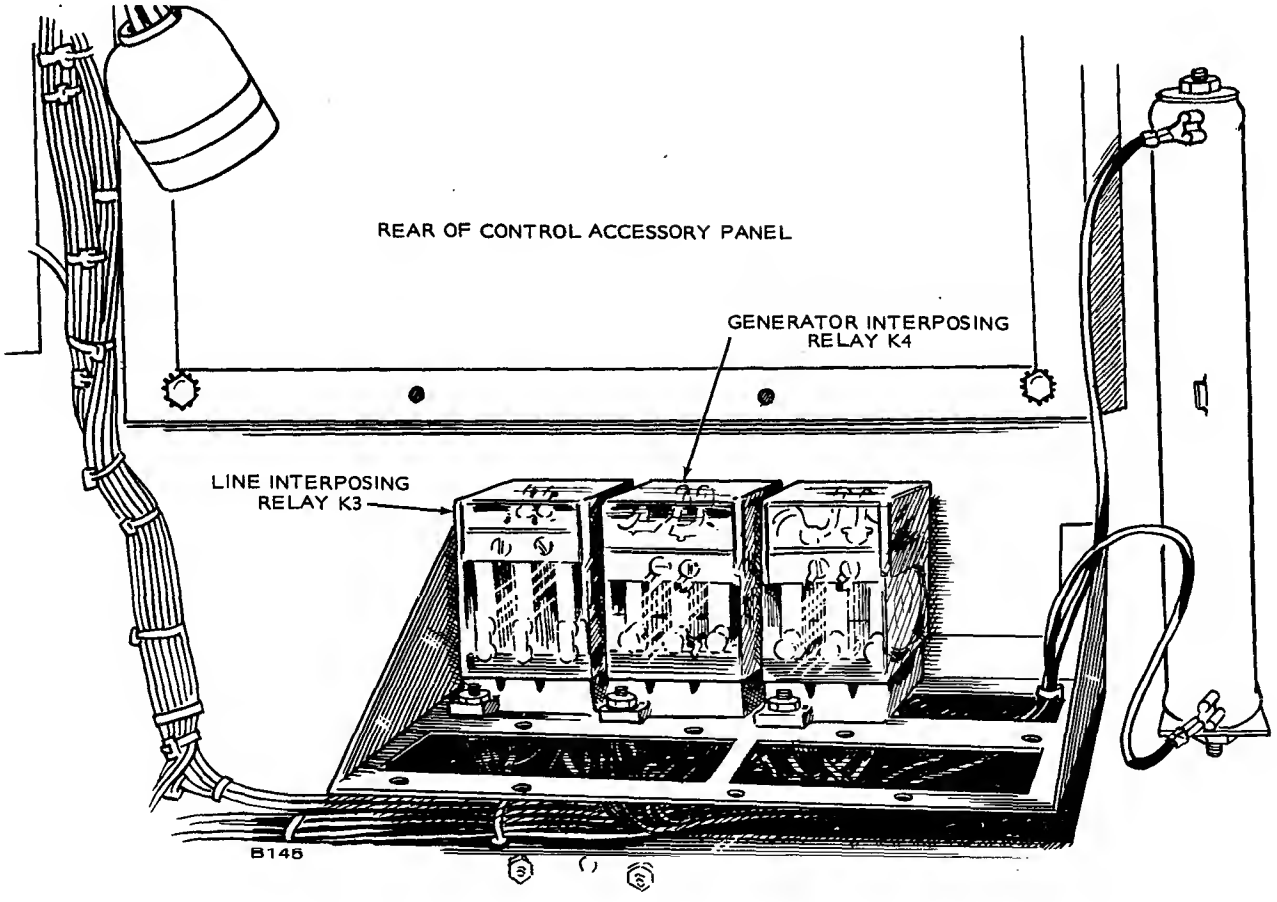


FIGURE 12. LOCATION OF INTERPOSING RELAYS

8. Move operation selector switch to "RMT" (on engine control for two-wire starting) or "NORMAL" (in cabinet for three-wire starting), whichever applies.
9. Move test transfer switch to "TEST." Generator set will start and run.
10. With a stopwatch or watch with a second hand, measure time from instant generator set reaches full speed until relay K4 contacts close. If time delay is correct or time you desire, proceed to Step 14. If not, proceed to Step 11.
11. Insert a small screwdriver through hole in front panel of transfer time delay module 8. Turn clockwise in small increments to increase the time delay, counterclockwise to decrease the time delay.
12. Move the test transfer switch to "NORMAL" to stop the generator set.
13. Repeat Steps 9 through 12 until the desired time delay is obtained.
14. Move the test transfer switch to "NORMAL."
15. Move operation selector switch to "STOP."
16. Remove the disconnect plug and close the control accessory panel.
17. Reconnect the disconnect plug.
18. Move the operation selector switch to "RMT" (on engine control for two-wire starting) or to "NORMAL" (in cabinet for three-wire starting), whichever applies.
19. Return selector switch to desired position, "WITHOUT LOAD" or "WITH LOAD."
20. Close the cabinet door.

Retransfer Time Delay: One of two retransfer time delays can be used to provide 0 to 30 minutes time delay on retransfer (retransfer of load to commercial power line). Both have similar adjustments. See the *OPERATION* section for operation description.

The one retransfer time delay shown on the left in Figure 13 has two lamps ("POWER ON" and "TIMING") and a time adjustment knob. To set the delay, turn the adjustment knob clockwise to the desired retransfer delay time.

Shown on the right in Figure 13 is the other retransfer time delay. It has one lamp ("POWER ON") and a time adjustment knob. The adjustment knob has a black pointer and a red time-remaining indicator pointer. Turn the adjustment knob clockwise until the black pointer aligns with the desired time delay.

Preheat Time Delay: The preheat time delay (module 16) for diesel generator sets with 3-wire starting is adjustable from 5 to 60 seconds. To change the delay, follow these instructions.

1. Open the cabinet door of the automatic transfer switch.
2. Move the selector switch to "WITHOUT LOAD."

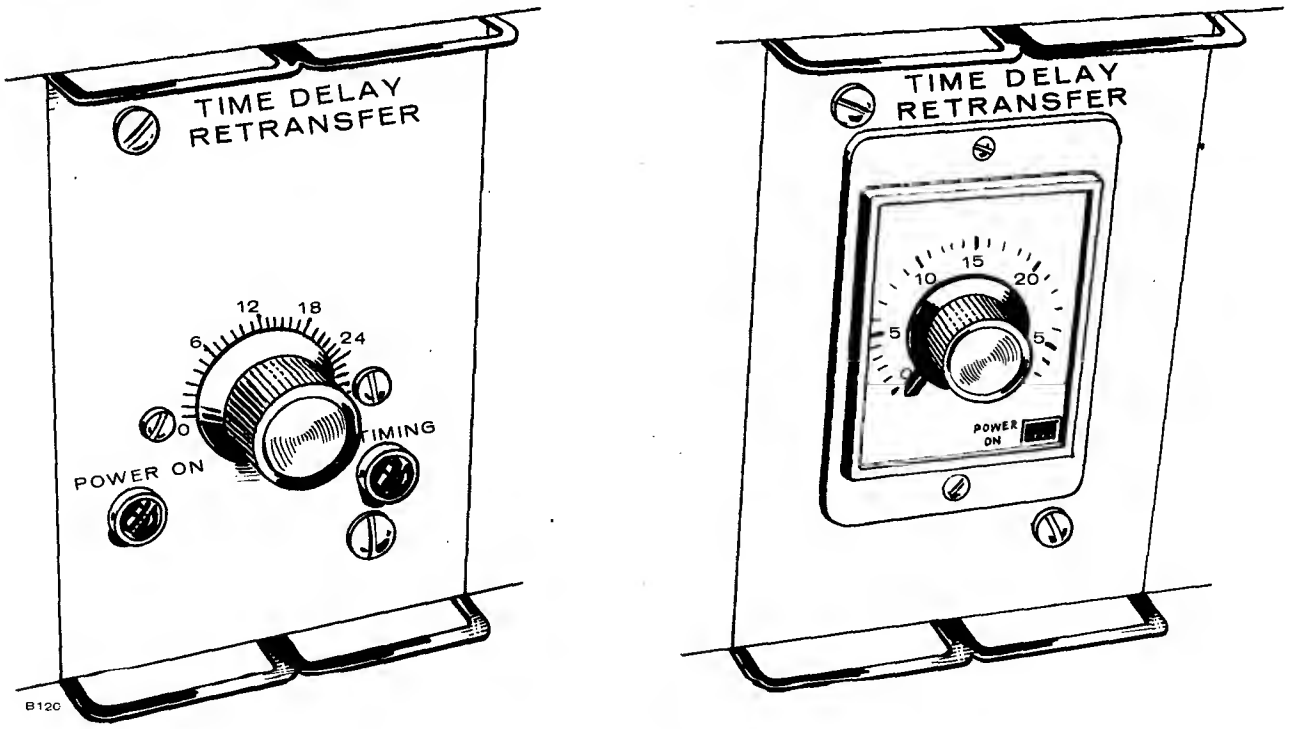


FIGURE 13. RETRANSFER TIME DELAYS

3. Move the test transfer switch to "TEST."
4. With a stopwatch or watch with a second hand, measure the amount of time the small lamp on module 16 (preheat time delay module) lights before engine cranks.
5. Move the test transfer switch back to "NORMAL."
6. If time delay for preheat is set as desired, proceed to Step 9. If a different time is desired, proceed to Step 7.
7. Insert a small screwdriver through the "PREHEAT" hole in the front panel of preheat time delay module 16. Turn potentiometer clockwise to increase preheat time, counterclockwise to decrease delay. Make adjustments in small increments.
8. Repeat Steps 3 through 7 until desired preheat time is obtained.
9. Move selector switch to desired position, "WITHOUT LOAD" or "WITH LOAD."
10. Close the cabinet door.

Control Accessory Groups 51 Through 55

Start, Transfer, and Preheat Time Delays: These time delays require the same adjustment procedures. Settings can range from 1 to 300 seconds (operator's manual lists suggested settings). To make settings, perform the following:

1. Open the cabinet door of the automatic transfer switch.
2. Turn the knob on the time delay clockwise to increase delay time, counterclockwise to decrease the delay time. See Figure 14.
3. Close the cabinet door.

Stop and Retransfer Time Delays: Both of these synchronous motor-driven time delays require the same adjustment procedure. Settings can range from 2 to 60 minutes (operator's manual lists suggested settings). To make settings, perform the following:

1. Open the cabinet door of the automatic transfer switch.
2. Set the time delay by turning the adjustment knob in the center of the delay. See Figure 15.

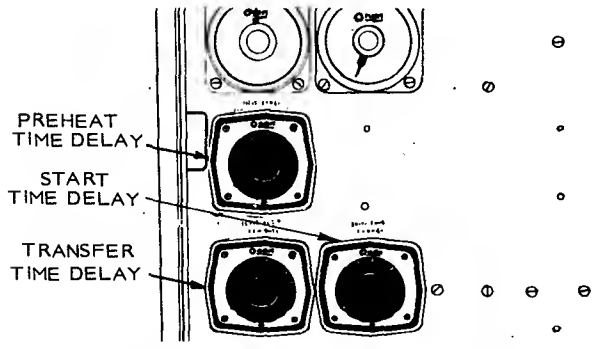


FIGURE 14. START AND TRANSFER TIME DELAY RELAYS

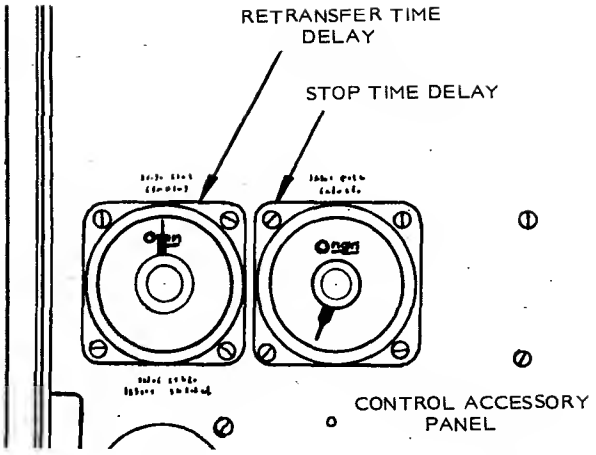


FIGURE 15. STOP AND RETRANSFER TIME DELAY RELAYS

The black pointer on the face of the time delay indicates the preset delay. The red pointer indicates the delay time left in operation.

3. Close the cabinet door.

OVERCRANK TIME (THREE-WIRE STARTING ONLY)

This adjustment applies only to an AT with a control accessory panel in groups 11 through 15.

Overcrank settings are made at the factory for approximately 75 ± 15 seconds cranking. To adjust, perform the following:

1. Remove the positive lead from the generator set's start solenoid or starter.
2. Open cabinet door of automatic transfer switch.
3. Move selector switch to "WITHOUT LOAD."
4. Move 2 to 3 wire converter module 9 selector switch to "NORMAL."
5. Move test transfer switch to "TEST." Overcrank lamp on automatic transfer switch should light at end of crank period. Measure the crank time with a stopwatch or watch with a second hand.
6. To change the time, insert a small screwdriver through the "CRANK TIME" hole in the front of the 2 to 3 wire converter module. Turn clockwise to increase the cranking time or counterclockwise to decrease the cranking time. Make adjustments in small increments.
7. Move test transfer switch to "NORMAL."
8. Push the "PUSH TO RESET" button on the 2 to 3 wire converter module.
9. Repeat Steps 5 through 8 until the desired cranking time is obtained.
10. Move selector switch to desired position, "WITHOUT LOAD" or "WITH LOAD."
11. Close the cabinet door.
12. Reconnect positive lead to generator set's starter or start solenoid.

BATTERY FLOAT CHARGE

For the following adjustments, a fully-charged battery, a hydrometer and an accurate voltmeter (1/2 percent accuracy) are needed. Onan recommends float voltages of: 13.3 volts for nominal 12-volt or 26.6 volts for nominal 24-volt lead-acid batteries; 13.8 to 14.5 volts for 10-cell nickel-cadmium batteries, or 27.6 to 29.0 volts for 20-cell nickel-cadmium batteries.

During the first few weeks of operation, the batteries should be checked periodically with a hydrometer. A high specific gravity, bubbling of electrolyte and loss of water indicate excessive float voltage. A drop in specific gravity indicates insufficient float voltage.

1. Connect the fully-charged battery (verify charge condition with the hydrometer).
2. Connect the voltmeter directly to the battery terminals.
3. Measure the battery voltage. If voltage is above the recommended float voltage, proceed to Step 4. If the voltage is below the recommended float voltage, proceed to Step 6.
4. Insert a small screwdriver through the hole in the front panel of battery charger module 6. Turn counterclockwise in small increments to decrease the float voltage.
5. After five minutes, measure the battery terminal voltage again. If voltage is still high, repeat Steps 4 and 5 until voltage stabilizes at the recommended float voltage. Proceed to Step 9.
6. Note charge current rate on charge ammeter on meter-lamp panel.
7. Insert a small screwdriver through hole in front panel of battery charger module 6. Turn clockwise in small increments to increase float voltage. Note increase in the charging current on the charge ammeter on the meter-lamp panel.
8. In approximately one hour or when charge current has decreased to initial value noted in Step 6, recheck battery terminal voltage. Repeat Steps 6 through 8 until the battery terminal voltage stabilizes at the recommended float voltage.
9. Check the battery with a hydrometer and check the battery terminal voltage periodically during the first few weeks of operation. Readjust the float charge rate if necessary.

AC VOLTAGE SENSORS

Voltage sensors can be used for either undervoltage or overvoltage sensing on line or generator power supplies. Range of the settings is from 90 to 140 volts for a nominal 120-volt system. For higher voltage systems, the "PICK-UP VOLTAGE" knob readings are multiplied by the following multiplying factors.

VOLTAGE	MULTIPLYING FACTOR
120	1.0
208	1.73
240	2.0
480	4.0
600	5.0

If you wish to check the calibration of the sensors before making the settings, see *Undervoltage Sensor Calibration* or *Overvoltage Sensor Calibration,* whichever applies. Otherwise, see *Undervoltage Sensor Settings* or *Overvoltage Sensor Settings.* Refer to Figure 16.

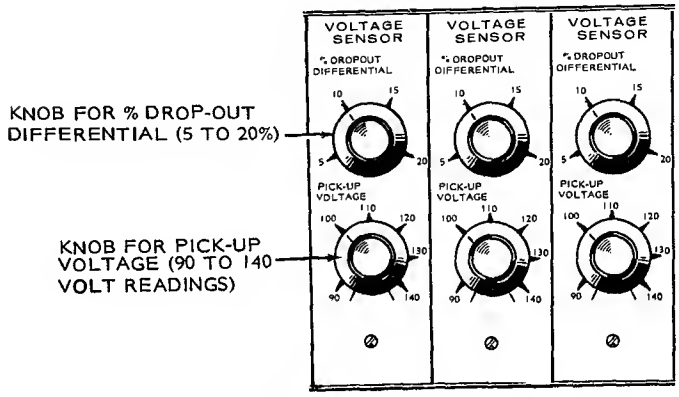


FIGURE 16. VOLTAGE SENSORS

Undervoltage Sensor Calibration

1. Open the cabinet door of the automatic transfer switch.
2. Move the operation selector switch to "STOP" (on engine control for two-wire starting, in cabinet for three-wire starting).
3. Turn all the undervoltage sensor knobs to minimum voltage setting.
4. Turn the "PICK-UP VOLTAGE" knob of the sensor to be calibrated to its clockwise limit.
5. Turn the "PICK-UP VOLTAGE" knob very slowly counterclockwise until you hear relay K3 pick up. This reading times the multiplying factor (for your system voltage) should equal the line voltage. Check line voltage with a voltmeter, divide by the factor to see if the reading is correct. If it is, proceed to Step 7. If not, proceed to Step 6.
6. *Setting Too Low:* (a) Turn the "PICK-UP VOLTAGE" knob to its clockwise limit, then counterclockwise to desired setting. (b) Insert a small screwdriver (1/8-inch blade) through the "CALIBRATE" hole and turn counterclockwise very slowly until you hear relay K3 pick up.

   Setting Too High: (a) Turn the "PICK-UP VOLTAGE" knob to its clockwise limit. (b) Insert a small screwdriver (1/8-inch blade) through the "CALIBRATE" hole and turn to its clockwise limit.

(c) Turn the "PICK-UP VOLTAGE" knob to desired setting. (d) Turn the "CALIBRATE" adjustment counterclockwise very slowly until you hear relay K3 pick up.

7. Repeat Steps 3 through 6 for each undervoltage sensor. If these calibrations are satisfactory for your application, make the sensor settings. See "Undervoltage Sensor Settings" (near end of section).
8. For a more accurate calibration and calibration of the "% DROP-OUT DIFFERENTIAL" knob, use the Onan Multi-Tester or a variac and use the following procedure.
9. Remove the twist-lock disconnect plug.
10. Open the control accessory panel.
11. Remove the plastic cover over the stepdown transformer terminals and remove the hot wire lead from the stepdown transformer's right side terminal of the terminal strip for the respective sensor. For example, if the nominal voltage is 208 volts, remove the wire lead from T2-3 for sensor 1. Do *not* remove the common (com) lead. See Figure 17.
12. If available, connect an Onan Multi-Tester to the transformer terminal strip and to the wire lead removed in Step 11 (using the instructions with the Multi-Tester). If using a variac, connect its common output lead to transformer T2-1 (com) and its other output lead to transformer terminal 2 (120-volt connection). See Figure 18.
13. Connect a voltmeter to the output leads of the variac.
14. Connect the variac input to a 120-volt AC source. Be absolutely sure the common from the transformer through the variac will be connected to the common of the line.

CAUTION **Common must connect to common of AC line. Otherwise, equipment damage can result.**

15. Reconnect the disconnect plug.

WARNING **Rear of control accessory panel and transfer switch are energized. Do not touch due to serious shock hazard!**

16. Turn all the undervoltage sensor knobs to minimum.
17. Adjust the Multi-Tester or variac to give a 120-volt output for the undervoltage sensor module.
18. Turn the "PICK-UP VOLTAGE" knob on the sensor to be calibrated to its clockwise limit.

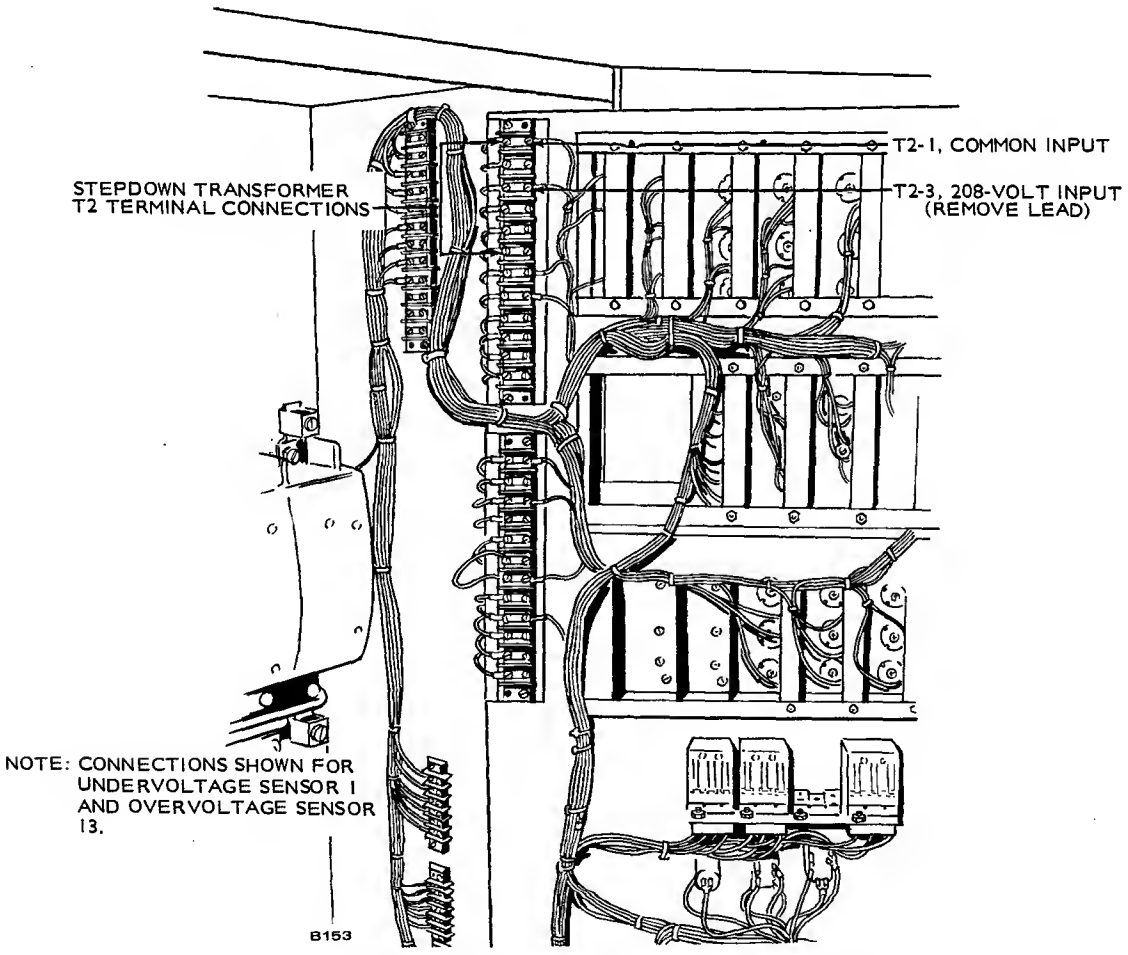


FIGURE 17. VOLTAGE SENSOR TRANSFORMER CONNECTIONS

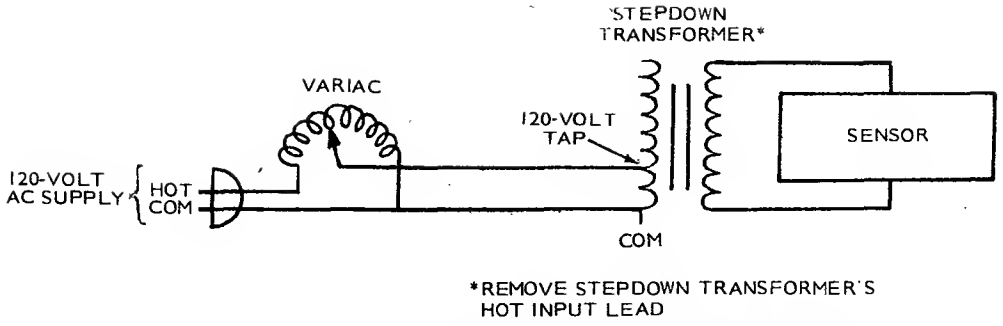


FIGURE 18. CONNECTION OF VARIAC TO STEPDOWN TRANSFORMER

19. Turn the knob very slowly counterclockwise until you hear relay K3 pick up. The knob should indicate 120 volts. If not, proceed to Step 20. If it does read 120 volts, proceed to Step 21.
20. *Setting Too Low:* (a) Turn the "PICK-UP VOLTAGE" knob to its clockwise limit, then counterclockwise to desired setting. (b) Insert a small screwdriver (1/8-inch blade) through the "CALIBRATE" hole and turn counterclockwise very slowly until you hear relay K3 pick up.

    Setting Too High: (a) Turn the "PICK-UP VOLTAGE" knob to its clockwise limit. (b) Insert a small screwdriver (1/8-inch blade) through the "CALIBRATE" hole and turn to its clockwise limit. (c) Turn the "CALIBRATE" adjustment counterclockwise very slowly until you hear relay K3 pick up.
21. With sensor module "PICK-UP VOLTAGE" knob at 120 volts and "% DROP-OUT DIFFERENTIAL" knob at maximum, lower the AC output voltage from the Multi-Tester or variac until the voltmeter reads 108 volts.
22. Turn "% DROP-OUT DIFFERENTIAL" knob counterclockwise until you hear relay K3 drop out. The knob should read approximately 10 (90 percent of 120 volts = 108 volts). If not, use a small screwdriver to loosen the knob and reposition so it indicates 10 percent.
23. Set the "PICK-UP VOLTAGE" and "% DROP-OUT DIFFERENTIAL" knobs at desired settings.
24. Decrease the voltage with the Multi-Tester or variac until you hear relay K3 drop out.
25. Increase the voltage with the Multi-Tester or variac until you hear relay K3 pick up.
26. Readjust the "PICK-UP VOLTAGE" and "% DROP-OUT DIFFERENTIAL" knobs to give the desired pickup and dropout voltages.
27. Rather than reconnecting the voltmeter, variac or Multi-Tester for the other undervoltage sensors, pull out the already calibrated module and replace it with one of the other undervoltage sensors. Then perform the calibration procedures in this position.
28. After calibration is complete, remove the disconnect plug.
29. Disconnect the Multi-Tester or variac and voltmeter.
30. Reconnect the wire lead removed in Step 11 and install the plastic cover over the terminals.
31. Close the control accessory panel and reconnect the disconnect plug.
32. Make the sensor settings. See "Undervoltage Sensor Settings" (near end of section).

Overvoltage Sensor Calibration

1. Open the cabinet door of the automatic transfer switch.
2. Move the operation selector switch to "STOP" (on engine control for two-wire starting, in cabinet for three-wire starting).
3. Turn the "% DROP-OUT DIFFERENTIAL" knobs to minimum and the "PICK-UP VOLTAGE" knobs to the clockwise limit (maximum).
4. On the sensor to be calibrated, turn "PICK-UP VOLTAGE" knob very slowly counterclockwise until you hear relay K6 close. This reading times the multiplying factor should equal the line voltage. Check line voltage with a voltmeter, divide by the factor to see if the reading is correct. If it is, proceed to Step 6. Otherwise, proceed to Step 5.
5. *Setting Too Low:* (a) Turn the "% DROP-OUT DIFFERENTIAL" knob counterclockwise to minimum. (b) Turn the "PICK-UP VOLTAGE" knob to the desired setting. (c) Insert a small screwdriver (1/8-inch blade) through the "CALIBRATE" hole and turn counterclockwise very slowly until you hear relay K6 pick up.

    Setting Too High: (a) Turn the "PICK-UP VOLTAGE" knob to its clockwise limit. (b) Insert a small screwdriver (1/8-inch blade) through the "CALIBRATE" hole and turn to its clockwise limit. (c) Turn the "PICK-UP VOLTAGE" knob to the desired setting. (d) Turn the "CALIBRATE" adjustment counterclockwise very slowly until you hear relay K6 pick up.
6. Repeat Steps 3 through 5 for each overvoltage sensor. If these calibrations are satisfactory for your application, make the sensor settings. See

"Overvoltage Sensor Settings" (near end of section).

7. For a more accurate calibration and calibration of the "% DROP-OUT DIFFERENTIAL" knob, use the Onan Multi-Tester or a variac and use the following procedure.
8. Remove the twist-lock disconnect plug.
9. Open the control accessory panel.
10. Remove the plastic cover over the stepdown transformer terminals and remove the hot wire lead from the stepdown transformer's right side terminal of the terminal strip for the respective sensor. For example, if the nominal voltage is 208 volts, remove the wire lead from T2-3 for sensor 13. Do *not* remove the common (com) lead. See Figure 17.
11. If available, connect an Onan Multi-Tester to the transformer terminals of the terminal strip and the wire lead removed using the instructions in the Multi-Tester. If using a variac, connect its common output lead to transformer T2-1 (com) and its other output lead to terminal 2 (120-volt connection). See Figure 18.
12. Connect a voltmeter to the output leads of the variac.
13. Connect the variac input to a 120-volt AC source. Be sure the common from the transformer will be connected to the common of the line.

CAUTION **Common must connect to common of AC line. Otherwise, equipment damage can result.**

14. Reconnect the disconnect plug.

WARNING **Rear of control accessory panel and transfer switch are energized. Do not touch due to serious shock hazard!**

15. Turn the "% DROP-OUT DIFFERENTIAL" knob(s) to minimum and the "PICK-UP VOLTAGE" knob(s) to the clockwise limit (maximum).
16. Adjust the Multi-Tester or variac to give a 120-volt output for the overvoltage sensor module.
17. Turn the "PICK-UP VOLTAGE" knob on the sensor to be calibrated counterclockwise very slowly until you hear relay K6 close. The knob should indicate 120 volts. If not, proceed to Step 18. If it does, proceed to Step 19.
18. *Setting Too Low:* (a) Turn the "% DROP-OUT DIFFERENTIAL" knob counterclockwise to minimum. (b) Turn the "PICK-UP VOLTAGE" knob to the desired setting. (c) Insert a small screwdriver (1/8-inch blade) through the "CALIBRATE" hole and turn counterclockwise very slowly until you hear relay K6 pick up.

    Setting Too High: (a) Turn the "PICK-UP VOLTAGE" knob to its clockwise limit. (b) Insert a small screwdriver (1/8-inch blade) through the "CALIBRATE" hole and turn to its clockwise limit. (c) Turn the "PICK-UP VOLTAGE" knob to the desired setting. (d) Turn the "CALIBRATE" adjustment counterclockwise very slowly until you hear relay K6 pick up.
19. Turn the sensor module "PICK-UP VOLTAGE" knob to 132 volts, relay K6 should drop out. Increase the AC output voltage from the Multi-Tester or variac until relay K6 picks up at approximately 132 volts.
20. Decrease the Multi-Tester or variac output voltage to check "% DROP-OUT DIFFERENTIAL." With the knob set at 5 percent, relay K6 should drop out at approximately 95 percent of 132 volts = 125 to 126 volts. If not, use a small screwdriver to loosen the knob and reposition so it indicates 5 percent with drop-out voltage of 125 to 126 volts.
21. Set the "PICK-UP VOLTAGE" and "% DROP-OUT DIFFERENTIAL" knobs at desired settings.
22. Increase the voltage with the Multi-Tester or variac until you hear relay K6 pick up.
23. Decrease the voltage with the Multi-Tester or variac until you hear relay K6 drop out.
24. Readjust the "PICK-UP VOLTAGE" and "% DROP-OUT DIFFERENTIAL" knobs to give the desired pick-up and drop-out voltages.
25. Rather than reconnecting the voltmeter, variac or Multi-Tester for the other overvoltage sensors (if more than one), pull out the already calibrated module and replace it with one of the other overvoltage sensors. Then perform the calibration procedures in this position.
26. After calibration is complete, remove the disconnect plug.
27. Disconnect the Multi-Tester or variac and voltmeter.
28. Reconnect the wire lead removed in Step 10 and install the plastic cover over the terminals.
29. Close the control accessory panel and reconnect the disconnect plug.
30. Make the sensor settings. See *Overvoltage Sensor Settings.*

Undervoltage Sensor Settings

1. Turn the "PICK-UP VOLTAGE" knob to the desired pick-up voltage (voltage at which load is transferred from generating set to commercial power). Unless you have special equipment which can be damaged by slight voltage changes, a setting which gives pickup at 90 percent of the nominal voltage is usually satisfactory. For example, 90 percent of 120 volts (for a 120-volt system) gives 108 volts for the knob setting.

   The drop-out differential is determined by the pick-up setting.

2. Turn the "% DROP-OUT DIFFERENTIAL" knob to the desired percent deviation below the pick-up voltage. This setting is the voltage at which the load is transferred from commercial power to the generating set. A setting of 15 percent is often satisfactory. For example, 15 percent of 108 volts (pick-up voltage from Step 1) is 16 volts. The

drop-out voltage is then pick-up voltage minus the differential voltage, 108 - 16 = 92 volts.

3. After settings are finished, move the operation selector switch to "RMT" (two-wire starting) or "NORMAL" (three-wire starting), whichever applies.

Overvoltage Sensor Settings

1. Turn the "PICK-UP VOLTAGE" knob to the desired pick-up voltage (voltage at which load is transferred from commercial power to the generating set). Unless you have special equipment which can be damaged by slight voltage changes, a setting (13 percent) which gives pick-up at 113 percent of the nominal voltage is usually satisfactory. For example, 113 percent of 120 volts (for a 120-volt system) gives 135 volts for the knob setting.

The drop-out differential is determined by the pick-up setting.

2. Turn the "% DROP-OUT DIFFERENTIAL" knob to the desired deviation below the pick-up voltage. This setting is the voltage at which the load is transferred from the generating set to commercial power. A setting of 5 percent is often satisfactory. For example, 5 percent of 135 volts (pick-up voltage from step 1) is approximately 7 volts. The drop-out voltage is then pick-up voltage minus the differential voltage, 135 - 7 = 128 volts.
3. After settings are finished, move the operation selector switch to "RMT" (two-wire starting) or "NORMAL" (three-wire starting), whichever applies.

TRANSFER SWITCH

WARNING **Due to the serious shock hazard, never touch the transfer switch unless all power is removed from the automatic transfer switch. Also set the operation selector switch to "STOP" and disconnect the generator set starting batteries.**

TRANSFER SWITCH DESCRIPTION

The following description is for a mechanically-held (line side) transfer switch. Line contacts are closed and locked in the following manner (Figure 19). The line-side main coil pulls the contacts closed. While the contacts are closing, a mechanical latch engages the contact control rod and locks the contacts closed. At the same time, an arm on the mechanical latch actuates the coil cutout switch (microswitch) which opens the main pull-in coil circuit. The contacts have been closed, locked in place and power removed from the main coil simultaneously. To open the line contacts, the trip coil must be energized by generator output to disconnect the latch mechanism, allowing the line contacts to open and generator contacts to close. A mechanical interlock in the transfer switch prevents generator and line contacts from closing at the same time.

CONTACTS

Contacts should never require cleaning or refacing for the life of the equipment except in unusually dusty or dirty environments. Discoloration of the silver does not affect their efficiency.

CAUTION **Filing the contact face destroys the mating surfaces.**

If the contacts ever do become burned or pitted, replace them in the following manner:

1. Remove the plastic hood from the transfer switch.
2. Remove the washers and springs.
3. Lift the contacts from the slide posts.
4. Remove attaching screws from the stationary contacts.
5. Install new contacts (curved silver contact surfaces facing inward).
6. Reassemble the springs and washers.
7. Reinstall the plastic hood.

TRANSFER SWITCH COILS

If a transfer switch coil is grounded or has an open circuit, replace by following appropriate instructions, for a 30 ampere, 60 through 100 ampere; or, 200, 225 and 400 ampere transfer switch.

30 Ampere Transfer Switch

1. Disconnect the coil lead wires.

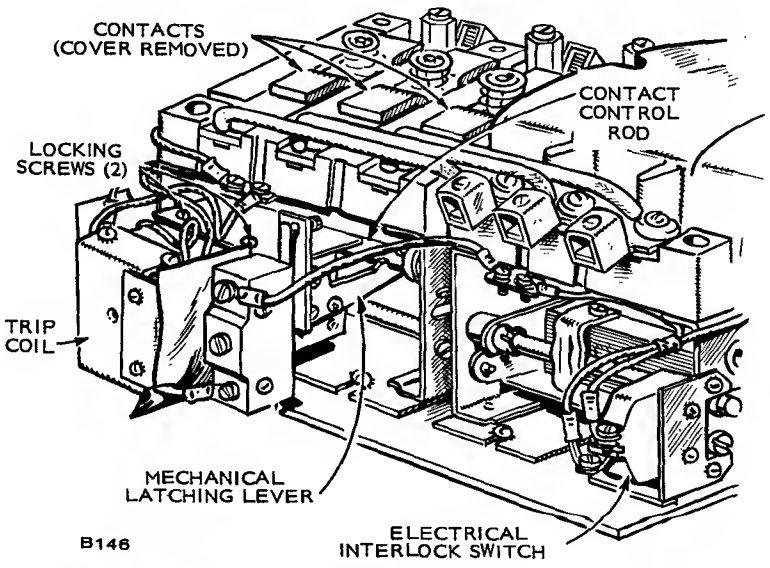


FIGURE 19. MECHANICALLY-HELD (LINE-SIDE) TRANSFER SWITCH

2. Remove the screw holding the stationary armature and coil assembly.
3. Slide out the stationary armature and coil assembly.
4. Remove the defective coil from the stationary armature and replace with new coil.

60 through 100 Ampere Transfer Switch

1. Disconnect the coil lead wires.
2. Pull off the hairpin-shaped retaining clips holding the control rod and slide out the control rod (use a needle-nose pliers).
3. Slide out the stationary armature and coil assembly.
4. Remove the defective coil from the stationary armature and replace with new coil.

200, 225 and 400 Ampere Transfer Switch

1. Disconnect the coil lead wires.
2. Remove the capscrews mounting the coil and stationary armature to the case.
3. Pull out the assembly.
4. Remove the defective coil from the stationary armature and replace with new coil.

MECHANICAL LATCH AND CUTOUT SWITCH

The latch mechanism and coil disconnect switch must be adjusted to open the main line circuit just as the contacts reach the closed position. If the main coil pull-in circuit is not broken, coil hum will result. If the coil disconnect switch opens before the transfer switch contacts are closed, the contacts will chatter.

Latching Mechanism Adjustments: Adjust the latching mechanism for positive locking by following this procedure.

1. Loosen the locking screws which secure the latching brackets.
2. Adjust the bracket for 1/16-inch (1.6 mm) clearance between the contact control rod and the latching lever when the main coil armature is fully seated (Figure 20).

The 200, 225 and 400 ampere transfer switches have a slightly different appearing latching mechanism but have the same operation sequence and use the same adjustments.

Cutout Switch Adjustments: Adjust the coil cutout switch by following this procedure.

1. Align the microswitch actuating arm and the adjusting screw on the latching lever.
2. Set the adjusting screw so the microswitch opens just as the latching lever engages the contact operating rod.
3. Operate the transfer switch several times to check the microswitch adjustment.
4. Adjust as required and seal the adjustment with paint.

TRANSFER SWITCH HUM

Hum of mechanically-held transfer switches is caused either by incorrect adjustment of the coil cutout switch or because of dirt between the armature sealing faces of the switch. If hum is due to the cutout switch adjustment, see "MECHANICAL LATCH AND CUTOUT SWITCH" in this section. If hum is due to dirt between the armature sealing faces, clean them with Dowclene EC, Chlorothene Nu, or similar electrical cleaning material. Use medium fine grade emery paper to clean rusted sealing faces. Remove all traces of emery dust.

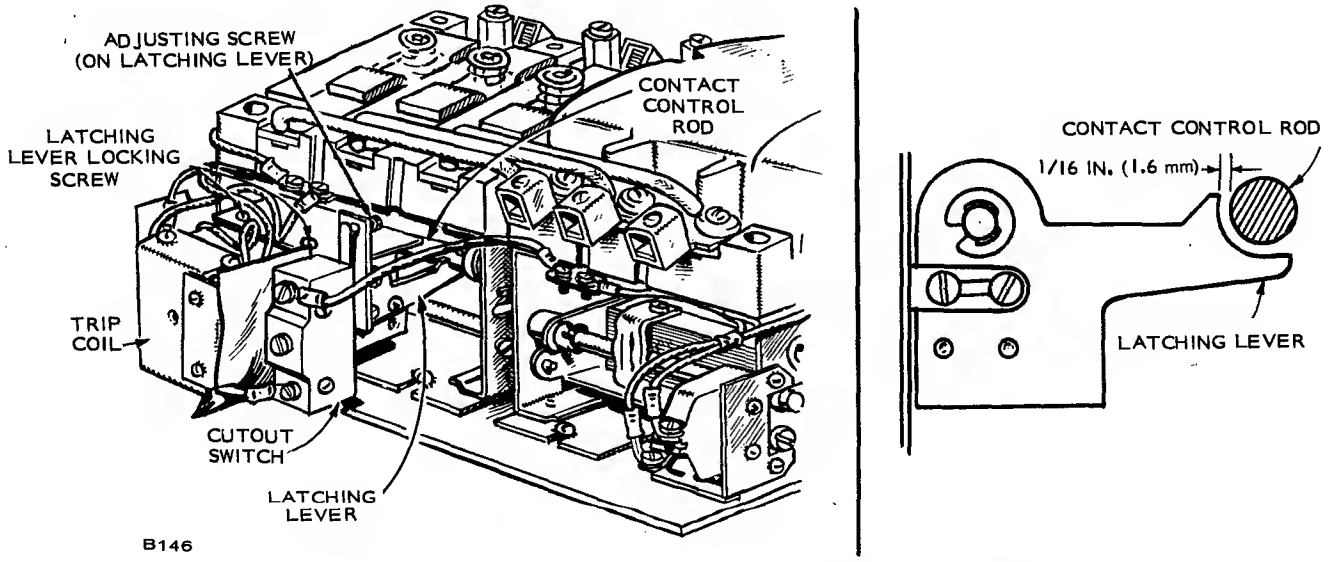


FIGURE 20. LATCH MECHANISM ON MECHANICALLY-HELD TRANSFER SWITCH

TROUBLESHOOTING

This troubleshooting section is divided into two main parts, one for automatic transfer switches with control accessory panels in groups 11 through 15 (modular-type panels), and those with control accessory panels in groups 51 through 55 (relay-type panels). Groups 11 through 15 are covered first with groups 51 through 55 starting on page 67.

AT'S WITH CONTROL PANEL GROUPS 11 THROUGH 15

To correct the problem, answer the question in the appropriate troubleshooting chart either "YES" or "NO," then refer to the number in the column and proceed to that step. Below is an index of problems.

INDEX

A.	Automatic transfer switch fails to immediately connect load to line when generator set is not operating.	YES	NO
1A.	Is normal line energized and delivering rated voltage to the line terminals of the transfer switch?	2A	—
2A.	Is control panel disconnect plug properly inserted into receptacle?	3A	—
3A.	Does automatic transfer switch have "NORMAL" and "EMERGENCY" indicating lamps?	4A	8A
4A.	Is the green "NORMAL" lamp lit?	5A	8A
5A.	Are contacts K1-CS closed to connect rated voltage across closing coil K1-CC?	7A	6A
6A.	Repair or replace K1-CS contacts.	—	—
7A.	Is closing coil K1-CC open circuited or is there an obstruction preventing transfer switch from closing?	—	—
8A.	Are relay contacts K4 (3-9) closed and making good contact?	11A	9A
9A.	Clean contacts K4 (3-9). Does this correct problem?	—	10A
10A.	Replace relay K4.	—	—
11A.	Does AT have an auxiliary transfer and retransfer time delay assembly (located in rear of standard cabinet below transfer switch)?	12A	14A
12A.	Does transfer switch operate if terminal TB11-1 is jumpered to TB11-2?	13A	14A
13A.	Repair or replace time delay K11.	—	—
14A.	Is transfer switch mechanically-held on generator side?	15A	19A
15A.	Are generator-side main contacts of transfer switch open?	19A	16A
16A.	Jumper normally-open K2 interlock contacts (in series with K2 trip coil). Does transfer switch operate?	17A	18A
17A.	Repair or replace normally-open K2 interlock contacts.	—	—
18A.	Is K2 trip coil open circuited or is trip coil mechanism obstructed?	—	—
19A.	Is rated voltage across closing coil K1-CC?	23A	20A
20A.	Does transfer switch operate if normally-closed K2-IC contacts are jumpered?	21A	22A
21A.	Repair or replace normally-closed K2-IC contacts.	—	—
22A.	Repair or replace cutout switch K1-CS.	—	—
23A.	Closing coil K1-CC is open-circuited or switch mechanism is obstructed preventing transfer switch closure.	—	—

B.	Automatic transfer switch fails to connect load to generator set when set runs during test with load or a normal power outage.	YES	NO
1B.	Is generator output near rated voltage?	2B	—
2B.	Does automatic transfer switch have "NORMAL" and "EMERGENCY" indicating lamps?	3B	4B
3B.	Is "EMERGENCY" lamp lit?	24B	5B
4B.	Is rated AC voltage present between TB7-8 and TB7-12?	30B	5B
5B.	Does transfer switch operate to close generator side when voltage sensor module 4 pick-up voltage knob is turned to minimum (counterclockwise)?	6B	7B
6B.	Is input voltage to transformer T3 connected to correct primary voltage tap to give nominal 40 volts AC on T3 (X1-X2)?	7B	—
7B.	Does transfer switch operate when voltage sensor module 4 is replaced by bypass plug or if K4 terminal A is jumpered to ground?	8B	9B
8B.	Replace voltage sensor module.	—	—
9B.	Is plug-in module 8 a transfer time delay (300-0924)?	10B	12B
10B.	Does transfer switch operate when transfer time delay module 8 is replaced by a bypass plug or if K4 terminal B is jumpered to TB1-6?	11B	12B
11B.	Replace transfer time delay module.	—	—
12B.	Is voltage on K4 (A-B) above 9 volts DC?	18B	13B
13B.	Is voltage from TB1-GND to TB1-B+ equal to rated battery terminal voltage?	14B	36B
14B.	Is voltage from TB3-7 to TB3-16 equal to rated battery voltage?	15B	36B
15B.	Is voltage from TB3-7 to TB1-6 greater than 9 volts DC?	16B	37B
16B.	Is voltage from TB3-7 to TB1-7 greater than 9 volts DC?	17B	38B
17B.	Is voltage from TB3-7 to K4-B greater than 9 volts DC?	18B	39B
18B.	Is relay K4 energized and are contacts K4 (4-7) closed properly?	20B	19B
19B.	Replace relay K4.	—	—
20B.	Is rated AC voltage present on transfer switch generator terminals?	21B	—

B.	(Continued)	YES	NO
21B.	Are contacts K3 (8-2) closed to bring rated AC voltage down to TB6-8? Measure for rated AC voltage between TB7-8 and TB7-6.	23B	22B
22B.	Replace relay K3.	—	—
23B.	Are K1 line-side contacts open?	27B	24B
24B.	Jumper normally-open K1 interlock contacts. Does transfer switch operate?	25B	26B
25B.	Repair or replace normally-open K1 interlock contacts.	—	—
26B.	Is K1 trip coil open circuited or is trip coil mechanism obstructed?	—	—
27B.	Does AT have an auxiliary transfer and retransfer time delay assembly (located in rear of standard cabinet below transfer switch)?	28B	30B
28B.	Does transfer switch operate if terminal TB11-5 is jumpered to TB11-6 of time delay assembly?	29B	30B
29B.	Repair or replace K12 time delay.	—	—
30B.	Is transfer switch mechanically held on generator side?	31B	33B
31B.	Does transfer switch operate if you jumper K2-CS cutout switch?	32B	33B
32B.	Replace K2-CS cutout switch.	—	—
33B.	Does transfer switch operate if terminal TB7-7 is jumpered to TB7-12?	34B	35B
34B.	Replace normally-closed K1-IC interlock contacts.	—	—
35B.	Closing coil K2-CC is open circuited or switch mechanism is obstructed preventing transfer switch closure.	—	—
36B.	Check for poor connection, defective battery, etc.	—	—
37B.	Replace module 5.	—	—
38B.	Check circuit from TB1-6 to TB1-7. It must be closed by a jumper or external circuit.	—	—
39B.	Replace module 8 with bypass plug. Make sure circuit from J8-22 to J8-12 is closed (close switch SI on bypass plug).	—	—

C.	Automatic transfer switch fails to start generator set during a power outage.	YES	NO
1C.	Perform generator set test by placing automatic transfer switch S2 in "WITHOUT LOAD" position and switch S1 in "TEST" position. Does generator set start?	15C	2C
2C.	Is plug-in module 9 a 2 to 3 wire converter 300-0926 with selector switch set in "NORMAL" position?	3C	11C
3C.	Push the module 9 reset switch. If engine does not crank, place module 9 selector switch in "HAND CRANK" position. Push start switch on engine control. Does engine crank and run?	4C	—
4C.	Check all wiring and switches between the B+, GND, and terminal 3 on the generator set, the B+, GND, and terminal 3 on TB1 in the automatic transfer switch for an open circuit. Does engine crank and run with engine test 1C?	—	5C
5C.	Jumper TB1-B+ and TB1-RMT together to put battery positive on remote line. Check to ensure voltage is present. Put module 9 selector switch in "NORMAL" position. Does engine crank?	15C	6C
6C.	Jumper TB1-GND to TB1-3. Does engine crank?	7C	4C
7C.	Is plug-in module 16 a preheat time delay module?	9C	8C
8C.	Replace 2 to 3 wire converter module 9.	—	—
9C.	Remove wire lead from J16-19. Does engine crank?	10C	8C
10C.	Replace preheat time delay module 16.	—	—
11C.	Is selector switch on engine control in the "REMOTE" position?	12C	—
12C.	Does generator set start, run and stop with switch located on the generator set? Return switch to remote position.	13C	—
13C.	Jumper TB1-B+ to TB1-RMT. Check to ensure that voltage from GND to TB1-RMT is equal to rated battery voltage. Does engine crank?	14C	—
14C.	Check circuit from TB1-B+ through AT switch S1 (2-1), switch S2 (2-3) to TB1-RMT for loose connection or open circuits.	—	—
15C.	Is module 7 a start-stop time delay module?	16C	18C
16C.	Replace start-stop time delay module 7 with a bypass module 300-1177 or jumper TB1-B+ to TB1-RMT. Does generator set start?	17C	18C
17C.	Replace start-stop time delay module.	—	—
18C.	Jumper TB1-B+ and J7-9. Does generator set start?	19C	—
19C.	Replace interposing line relay K3.	—	—

D.	**Automatic transfer switch fails to automatically retransfer load from generator set to line after normal power returns. Generator set continues to run.**	YES	NO
1D.	Check battery charging fuse F1. Is fuse OK?	2D	—
2D.	Is rated AC voltage present at transfer switch line terminals?	3D	—
3D.	Is module 11 a retransfer time delay? **If it is and the time has been returned to zero for tests, etc., make sure the timer does not go back beyond zero. Otherwise, the generator set will not retransfer the load.**	4D	7D
4D.	Is "POWER ON" lamp lit in motor timer module 11?	5D	7D
5D.	Has the motor timer completed its time delay period?	24D	6D
6D.	Replace motor timer if it is stalled (it does not time out).	—	—
7D.	Does control accessory panel have a manual-automatic selector switch S3 and a push to retransfer switch S4?	8D	9D
8D.	Place manual-automatic selector switch S3 in "AUTO" position. Does automatic transfer switch retransfer load to line (at end of time delay if used)?	—	9D
9D.	Record the pick-up voltage dial settings with small pencil marks on voltage sensor modules 1, 2 and 3 (only one on single-phase automatic transfer switch). Turn pick-up voltage knobs to 90 or below. Does motor timer "POWER ON" lamp light (if retransfer time delay used)? Does automatic transfer switch retransfer load to line?	10D	11D
10D.	Recheck the normal line voltage and output voltage of transformers T2, T4 and T5 for lower than normal readings. Make sure voltage sensors are set for correct pickup voltages.	—	—
11D.	Does control accessory panel have a manual-automatic selector switch S3 and push to retransfer switch S4?	12D	19D
12D.	Remove voltage sensor modules 1, 2 and 3 and replace with 300-0927 bypass modules or jumper TB3-5 to K5-A. Do K3 and K5 pick up when S4 is pushed with S3 in automatic position to light the motor timer "POWER ON" lamp (if equipped with retransfer time delay)? Does automatic transfer switch retransfer load to line (after retransfer time delay if equipped)?	13D	14D
13D.	*Three-Phase:* Isolate malfunctioning voltage sensor by plugging each individually into position 3 with bypass plugs in positions 1 and 2. Then replace voltage sensor module. Does transfer switch retransfer load to line?	10D	—
	Single-Phase: Replace voltage sensor in position 1. Does transfer switch retransfer load to line?	10D	—
14D.	Is voltage of K5 (A-B) at 9 volts DC or higher with switch S4 closed or S3 in "AUTO" position?	15D	16D
15D.	If voltage is present on coil K5 (A-B) but relay does not pick up, coil is probably open and must be replaced.	—	—

D.	(Continued)	YES	NO
16D.	Is voltage TB3-5 to K5-A less than 2 volts DC when S4 is pushed or S3 is in "AUTO" position?	17D	23D
17D.	Is voltage from TB3-5 to S4-1 approximately 12 VDC when S4 is pushed or S3 is in "AUTO" position?	OK	18D
18D.	Is voltage from TB3-5 to S4-2 approximately 12 VDC?	OK	19D
19D.	Is voltage from TB3-5 to TB3-11 approximately 12 VDC?	OK	20D
20D.	Is voltage from TB3-5 to S2-5 equal to battery voltage?	21D	22D
21D.	Replace plug-in module 5.	—	—
22D.	Check wiring from B+ terminal to this point for open circuit.	—	—
23D.	Check all wiring and connections between these two points for open circuit or poor connection. Jumper these two points to check relay K5 operation with switch S3 in automatic position.	—	—
24D.	Did relay K3 pick up at end of time delay to close K3 (6-9) and transfer load to line?	2A	25D
25D.	Measure K3 (A-B) voltage. If it is 9 volts or greater, coil probably is open. Replace relay.	—	—

E.	**Automatic transfer switch delays transferring load to line until generator set stops after normal power outage.**	YES	NO
1E.	Do relay contacts K3 (6-9) close as K3 relay picks up when the normal source voltage returns?	2E	3E
2E.	Clean contacts K3 (6-9). Does this correct problem?	—	3E
3E.	Replace relay K3.	—	—

F.	**Generator set starts during normal service.**	YES	NO
1F.	Is control panel disconnect plug properly inserted into receptacle?	2F	—
2F.	Does automatic transfer switch have an exerciser clock?	3F	4F
3F.	Is exerciser clock turned to the exercise period?	—	4F
4F.	Record pick-up voltage dial settings with small pencil marks on voltage sensor modules 1, 2 and 3 (one for control accessory group 15 and single-phase AT). Turn pick-up voltage knobs to 90 or below. Does generator set stop (after time delay)? After test, return knobs to original settings.	5F	6F
5F.	Recheck the normal line voltage and output voltage of transformers T2, T4 and T5 for lower than normal readings. Make sure voltage sensors are set for correct pick-up voltage.	—	—
6F.	Are modules 13, 14 and 15 overvoltage sensors (only one for single-phase automatic transfer switch)?	7F	10F
7F.	Record pick-up voltage dial settings with small pencil mark on voltage sensor modules. Turn pick-up voltage knobs to 140 volts. Does generator set stop (after time delay)? After test, return knobs to original settings.	8F	9F
8F.	Recheck the normal line voltage and output voltage of transformers T2, T4 and T5 for higher than normal readings. Make sure voltage sensors are set for correct pick-up voltage.	—	—
9F.	Is relay contact K6 (1-7) closed and making good contact?	10F	—
10F.	Is relay K3 energized, contacts K3 (1-7) open and contacts K3 (9-6) closed properly?	12F	11F
11F.	Measure K3 (A-B) voltage. If it is 9 volts or more, the relay coil probably is open. Replace relay.	—	—
12F.	Remove start-stop time delay module 7 and replace with the bypass plug module. Does generator set stop?	13F	—
13F.	Replace start-stop time delay module.	—	—

G.	Exerciser clock fails to start generator set.	YES	NO
1G.	Does exerciser motor timer M1 operate? Voltage on M1 (1-2) should be approximately 120 VAC.	2G	5G
2G.	Has overcrank condition occurred (note overcrank lamp on AT-E models)?	—	3G
3G.	Do contacts M1 (4-5) open and contacts M1 (3-5) close to put battery voltage on TB1-RMT terminal during exercise period? See instructions for exercise clock adjustments.	1C	4G
4G.	Replace the microswitch on the exerciser clock or replace exerciser clock.	—	—
5G.	Is one-ampere fuse F1 in control panel "blown"?	6G	—
6G.	Replace fuse F1.	—	—

H.	Battery Charger Malfunctions	YES	NO
1H.	Does battery charger fail to charge? Charge ammeter shows zero current and battery discharges?	6H	2H
2H.	Does battery charger charge at high rate and cause battery to lose electrolyte (look for bubbling)?	4H	3H
3H.	Does charger supply current but battery fails to supply sufficient cranking power?	5H	—
4H.	Lower charger float voltage a small amount. Measure specific gravity once a week and readjust float voltage until charger will hold recommended specific gravity without overcharging. Increase float voltage again if specific gravity drops below recommended value.	—	—
5H.	Check battery under load to see if it might have a dead cell. Check specific gravity of battery electrolyte and increase float voltage a small amount (check specific gravity once per week and reset float voltage until charger will hold recommended specific gravity).	—	—
6H.	Check fuse F1. Is fuse OK?	7H	—
7H.	Does primary of transformer T1 have rated input on correct terminals to produce approximately 20 volts AC on T1 (X1-X2) or approximately 40 volts on T1 (X1-X3)?	8H	—
8H.	Remove module 6 and measure AC voltage at J6 (15-21). Is this approximately 20 volts for AT-D or AT-E and 40 volts for AT-C?	9H	—
9H.	Replace battery charger module 6 with new module.	—	—

USE OF BYPASS PLUG OR EXTENSION BOARD MODULE

A bypass module plug can bypass the operation of the voltage sensors, start-stop time delay, transfer time delay or retransfer time delay. The extension board module extends the voltage sensor or time delay out from the control accessory panel to expose printed circuit components for troubleshooting, testing, etc. Follow these instructions for the particular module.

Extension Board Module

1. Open cabinet door of automatic transfer switch.
2. Position the operation selector switch at "STOP" (on engine control for two-wire starting or on automatic transfer switch for three-wire starting).
3. Remove the twist-lock disconnect plug.
4. Open the control accessory panel.
5. Remove the plug-in module.
6. Note position and remove keying plug(s) from the printed circuit board receptacle by sliding the plug(s) to the right.
7. Insert extension board module into receptacle.
8. Insert module removed in Step 5 into the back of the extension module (Figure 21).
9. Close control accessory panel and connect disconnect plug.

WARNING **Module extended from extension board module is now energized and presents a serious shock hazard!**

10. Perform module adjustments or tests using appropriate instructions.
11. When the tests, etc. are completed, remove twist-lock disconnect plug and open control accessory panel.
12. Remove both modules from the control accessory panel.
13. Reinsert keying plug(s) removed in Step 6, into printed circuit board receptacle.
14. Plug in module removed in Step 5 or install new module, if required, into control accessory panel.
15. Close control accessory panel and connect disconnect plug.
16. Move the operation selector switch to "RMT" (two-wire starting - on engine control) or "NORMAL" (three-wire starting - in cabinet), whichever applies.
17. Close cabinet door.

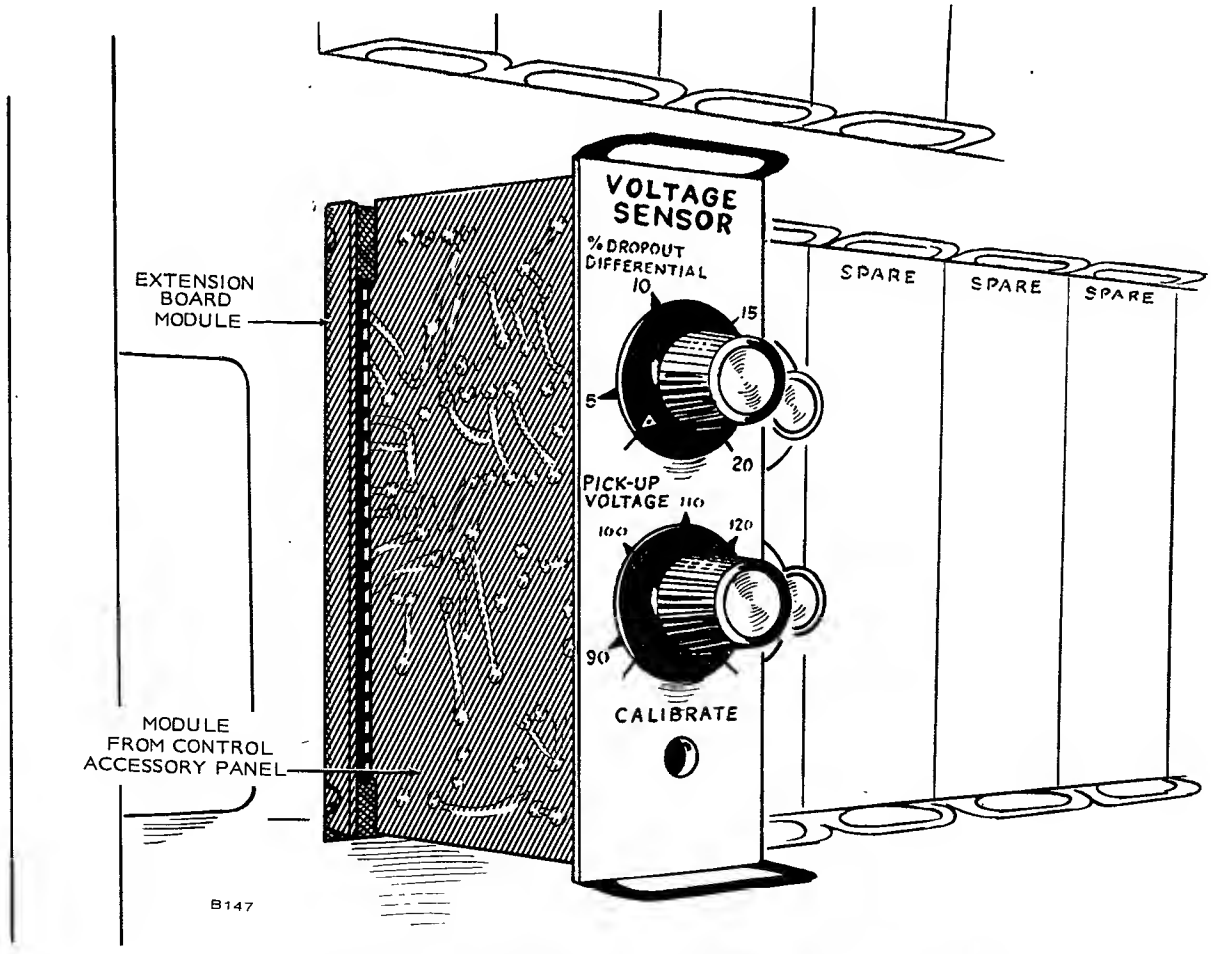


FIGURE 21. EXTENSION BOARD MODULE IN CONTROL ACCESSORY PANEL

Bypass Plug Module 300-0927

Do not use bypass plug module 300-0927 to bypass start-stop time delay module 7 because it won't operate the automatic transfer switch. For the start-stop delay position 7, use the start-stop bypass plug module 300-1177.

1. Open cabinet door of automatic transfer switch.
2. Position the operation selector switch at "STOP" (on engine control for two-wire starting or on automatic transfer switch for three-wire starting).
3. Remove the twist-lock disconnect plug.
4. Open the control accessory panel.
5. Remove the module to be bypassed.
6. Slide the keying plug(s) to the right and pull out from the printed circuit board receptacle. Note position of the keying plug(s) when removing.
7. Close the control accessory panel.
8. Set switches S1 and S2 on the bypass module to the correct position (instructions on bypass module printed circuit board) for the particular bypass and insert the module. See Figure 22.
9. Connect the disconnect plug, reposition the operation selector switch and check operation of the automatic transfer switch.

   If the 1/4 ampere fuse on the bypass plug burns out, check and correct switch positions, then replace the fuse before inserting the bypass module again.

10. Move the operation selector switch to "STOP" after test is finished.
11. Remove disconnect plug and open control accessory panel.
12. Take out bypass plug module and reinstall keying plug(s) removed in Step 6.
13. Reinstall module from Step 5 or install new module, if required.
14. Close control accessory panel and connect the disconnect plug.
15. Move the operation selector switch to "RMT" (two-wire starting - on engine control) or "NORMAL" (three-wire starting - in cabinet), whichever applies.
16. Close cabinet door.

Start-Stop Bypass Plug Module 300-1177

Use this bypass plug module in place of the start-stop time delay module (position 7 of control accessory panel). It's unnecessary to remove the keying plugs when using this bypass plug module.

1. Open cabinet door of automatic transfer switch.
2. Position the operation selector switch at "STOP" (on engine control for two-wire starting or on automatic transfer switch for three-wire starting).

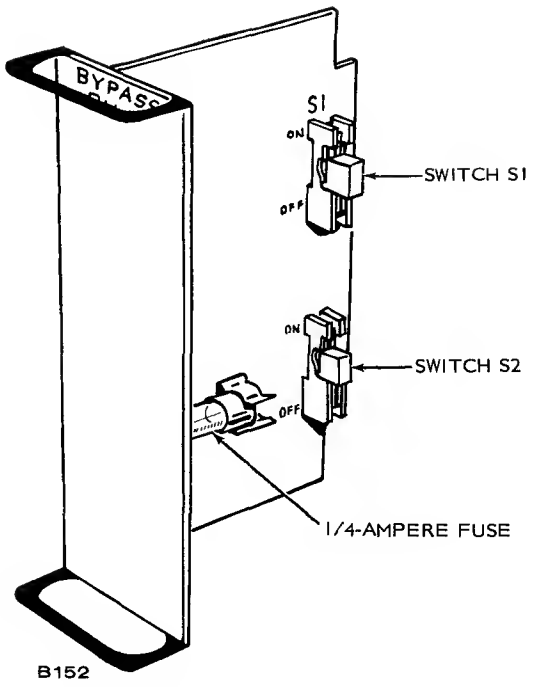


FIGURE 22. BYPASS PLUG MODULE

3. Remove start-stop time delay module 7.
4. Insert the bypass plug module into position 7.
5. Reposition the operation selector switch and check operation of the automatic transfer switch.
6. Move the operation selector switch to "STOP" after the test is finished.
7. Remove the start-stop bypass plug module.
8. Reinstall module from Step 3 or install new module, if required.
9. Move the operation selector switch to "RMT" (two-wire starting on engine control) or NORMAL" (three-wire starting - in cabinet), whichever applies.
10. Close cabinet door.

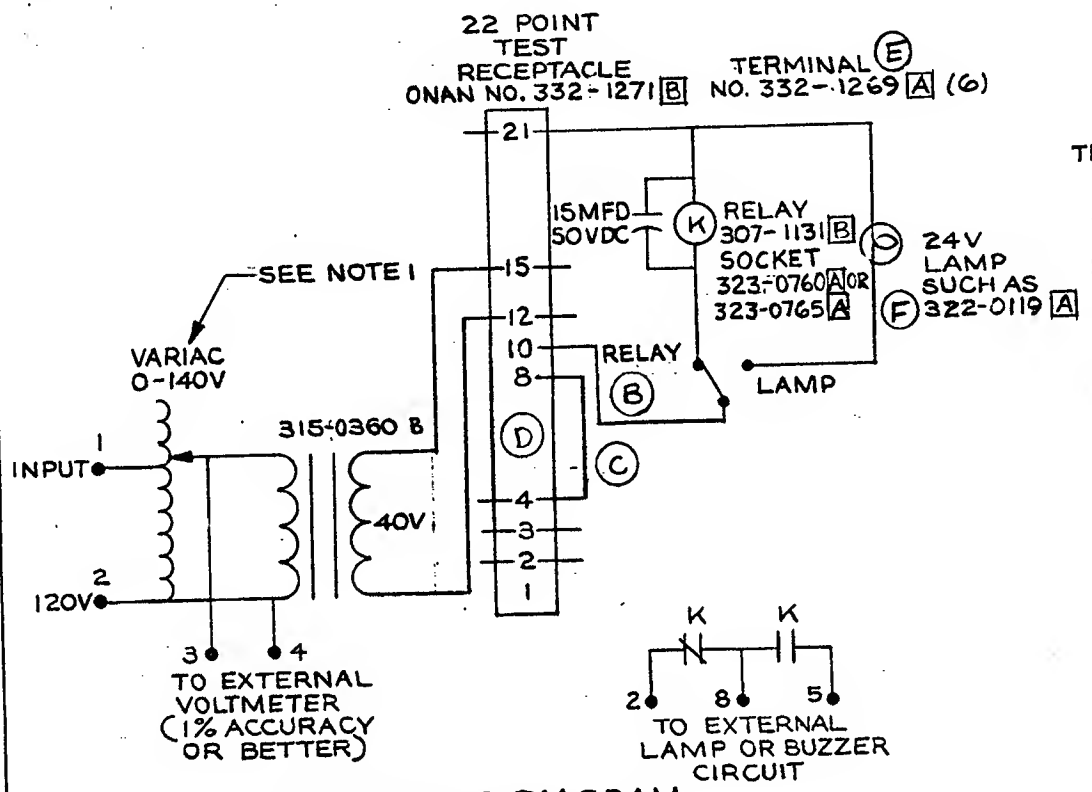
MODULE TEST PROCEDURES

The following drawings give test procedures for the individual modules. Note on the drawings that test circuits are usually required. If you find a module defective or the correct calibration cannot be obtained, replace it.

Module wiring diagrams are in Onan publication "WIRING DIAGRAMS AND PARTS LISTING" (number 962-0501).

539-0161

LET	REVISIONS	ZONE	ENG	CKR	DATE
A	REVISED		JV	CP	2-9-71
B	RELAY MOVED FROM # 8 TO # 10	C-3	J.P.	CP	2-3-72
C	JUMPER MOVED FROM # 6 TO # 8	C-3	J.P.	CP	
D	PINS # 5, 6, & 7 REMOVED	C-3	J.P.	CP	
E	WAS # 332A1267	D-2	HBM	CP	9-27-73
F	WAS # 332A119	C-2	HBM	CP	9-27-73



SCHEMATIC DIAGRAM
TEST CIRCUIT

NOTES:

1. VARIAC MUST BE SMALL SIZE WITH VERY SMOOTH CONTROL FOR FINE ADJUSTMENT OF VOLTAGE IN RANGE OF 90-140 VOLTS.

TEST PROCEDURE FOR VOLTAGE SENSOR 300-0780 D

1. SET % DIFF DROPOUT CONTROL TO 5%.
2. SET PICK-UP CONTROL TO MARK BETWEEN 110 & 120V. THIS IS 115V POSITION.
3. SET CALIBRATE CONTROL TO FULL CLOCKWISE POSITION WITH A NARROW BLADE SCREWDRIVER.
4. ENERGIZE TEST CIRCUIT AND ADJUST FOR 115 VOLTS INPUT.
5. SLOWLY TURN THE CALIBRATE CONTROL CCW UNTIL RELAY PICKS UP OR LAMP LIGHTS.
6. REDUCE INPUT VOLTAGE SLOWLY TO 80 VOLTS. RELAY SHOULD DROP OUT AT APPROXIMATELY 109 VOLTS.
7. SET PICK-UP CONTROL TO 90 VOLTS THEN SLOWLY INCREASE INPUT VOLTS TO SEE THAT RELAY PICKS UP AT 90 ± 2 VOLTS.
8. INCREASE PICK-UP VOLTAGE SETTING TO 140 VOLTS. RELAY SHOULD DROP OUT.
9. INCREASE INPUT VOLTAGE. RELAY MUST PICK UP AT 140 ± 2 VOLTS. DIAL MUST HAVE RANGE TO COVER 90 VOLTS TO 140 VOLTS. IF IT WILL NOT, IT WILL BE NECESSARY TO CHANGE CALIBRATE POINT SLIGHTLY.
10. DECREASE INPUT VOLTAGE SLOWLY, RELAY SHOULD DROP OUT AT APPROXIMATELY 133 ± 4 VOLTS.
11. INCREASE VOLTAGE TO 140 VOLTS. IF RELAY DOES NOT PICK-UP, ADJUST PICK-UP CONTRUL UNTIL RELAY DOES OPERATE.
12. SET % DIFF DROPOUT CONTROL TO 20% THEN REDUCE INPUT VOLTAGE. RELAY SHOULD DROP OUT AT 112 ± 4 VOLTS.

ITEM	PART NO.	QTY.	DESCRIPTION OR MATERIAL

NEXT ASSEMBLY	SIMILAR TO
TOLERANCES UNLESS OTHERWISE SPECIFIED	DECIMALS
FRACTIONS ±	2 PLACE ±
ANGLES ±	3 PLACE ±

539-0161

MF	SA	COST	HSG	TP	50 RELAY	GD	PUR
MILL	CRANK	CK	PUNCH	WELD	INSP	QC	PO

DESIGN APPROVED — DR JER — ENG JIM VINT — CKR CP
SAMPLE RELEASE — DATE 10-16-70 — SC ~
PROD RELEASE JV 11-13-20 — MODEL
SEPIA FROM

Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

TEST PROCEDURE

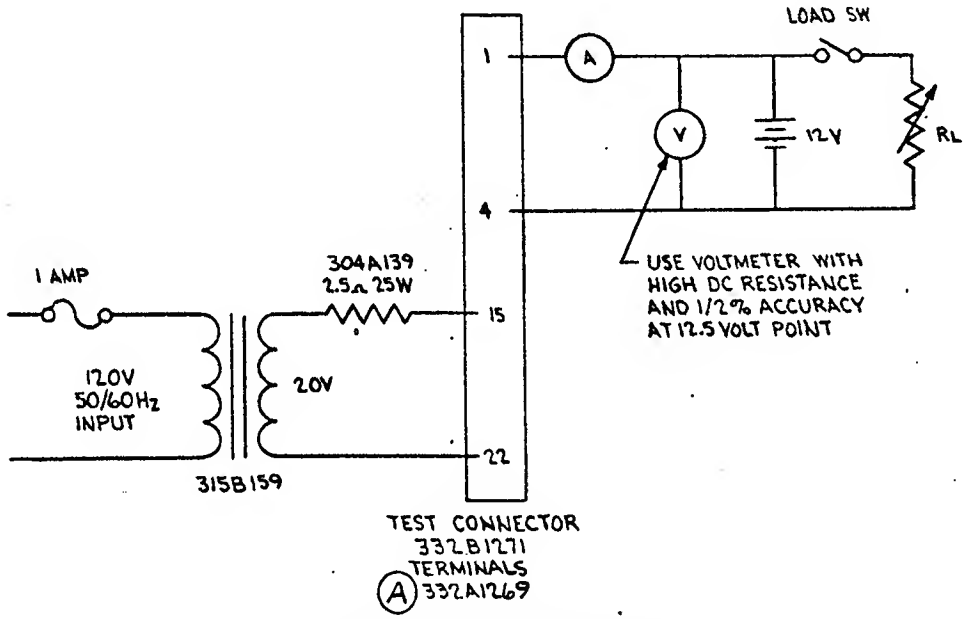
PATT NO

DWG NO. 539-0161 B

FORM 80071

539-0163

LET	REVISIONS	ZONE	ENG	CKR	DATE
A	WAS # 332 A 1267	4-A			9-27-73



SCHEMATIC DIAGRAM
TEST CIRCUIT

TEST PROCEDURES

1. PLUG FLOAT CHARGER INTO TEST CIRCUIT

2. TURN CALIBRATE POT FULLY CLOCKWISE
3. CHECK OUTPUT CURRENT
   APPLY 120V TO TRANSFORMER. OBSERVE CHARGE CURRENT AND VOLTAGE. CURRENT MUST EQUAL OR EXCEED 2 AMPERES AT 12.6 VOLTS. CLOSE LOAD SWITCH AND ADJUST RL TO INCREASE CURRENT IF VOLTAGE GOES ABOVE 12.6 WITH LESS THAN 2 AMPERES OUTPUT. OPEN LOAD SWITCH.

4. CHARGE BATTERY UNTIL VOLTAGE RISES ABOVE 15.0 VOLTS. TO MAKE SURE REG. COVERS 12.5 TO 15.0V RANGE.

5. FACTORY ADJUST
   TURN CALIBRATE POT TO THE LEFT UNTIL THE CHARGE CURRENT DROPS TO ZERO WITH 13.3 VOLTS AT BATTERY TERMINALS FOR LEAD ACID BATTERIES OR 14.0 VOLTS FOR NICKLE CADMIUM BATTERIES. (UNLESS ORDER SPECIFIES SOME OTHER VOLTAGE).

6. PUT A SPOT OF GLYTOL OR PAINT ON THE POT SHAFT AND BODY TO SERVE AS A REFERENCE POINT

ITEM	PART NO.	QTY.	DESCRIPTION OR MATERIAL

NEXT ASSEMBLY	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED

	DECIMALS
FRACTIONS ±	2 PLACE ±
ANGLES ±	3 PLACE ±

539-0163

MFG	SA	COST	MSG	TP	RELAY	GD	PUR
MILL	CRANK	CK	PUNCH	WELD	INSP	QC	PO

DESIGN APPROVED
SAMPLE RELEASE
PROD RELEASE Jim Vint
SEPIA FROM

DR JTM | ENG Jim Vint | CKR
DATE 12-3-70 | SC —

MODEL 2 AMP BATTERY FLOAT CHARGER

Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

TEST PROCEDURE 12V

PATT NO

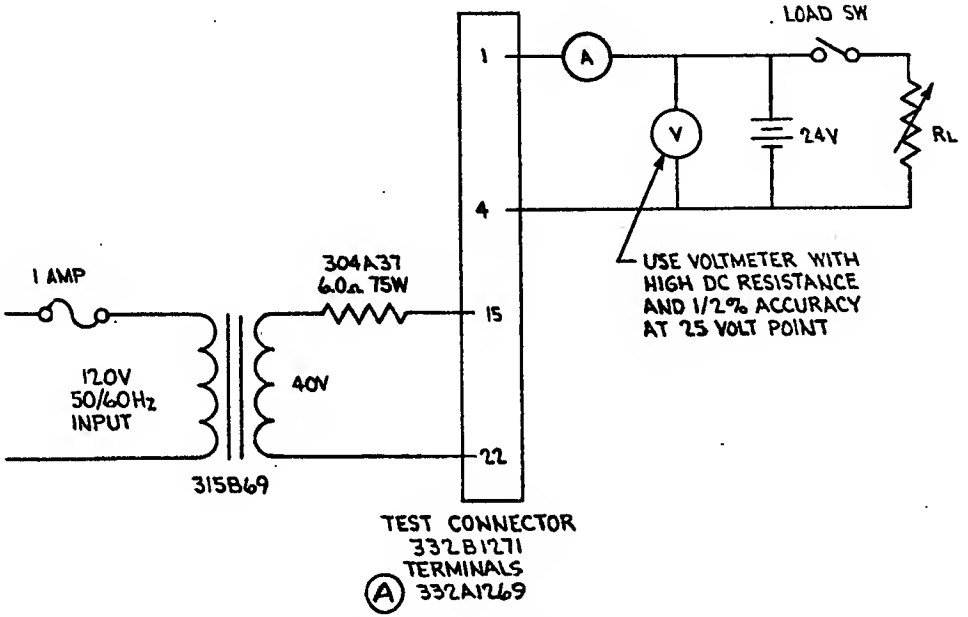
DWG NO 539-0163 B

FORM BC071

57

539-0164

LET	REVISIONS	ZONE	ENG	CKR	DATE
A	WAS # 332-1269	A-4	JTM	CP	9-27-73



SCHEMATIC DIAGRAM
TEST CIRCUIT

TEST PROCEDURES

1. PLUG FLOAT CHARGER INTO TEST CIRCUIT
2. TURN FLOAT VOLTAGE ADJUSTMENT POT FULLY CLOCKWISE
3. APPLY 120V TO TRANSFORMER. OBSERVE CHARGE CURRENT AND VOLTAGE. CURRENT MUST EQUAL OR EXCEED 2 AMPERES AT 25.2 VOLTS. CLOSE LOAD SWITCH AND ADJUST RL TO INCREASE CURRENT IF VOLTAGE GOES ABOVE 25.2 WITH LESS THAN 2 AMPERES OUTPUT. OPEN LOAD SWITCH.
4. CHARGE BATTERY UNTIL VOLTAGE RISES ABOVE 26.6 VOLTS.
5. TURN FLOAT VOLTAGE ADJUSTMENT POT TO THE LEFT UNTIL THE CHARGE CURRENT DROPS TO ZERO WITH 26.6 VOLTS AT BATTERY TERMINALS.
6. PUT A SPOT OF GLYTOL OR PAINT ON THE POT SHAFT AND BODY TO SERVE AS A REFERENCE POINT.

ITEM	PART NO.	QTY.	DESCRIPTION OR MATERIAL

	539B163
NEXT ASSEMBLY	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMALS
FRACTIONS ±
2 PLACE ±
ANGLES ±
3 PLACE ±

539-0164

ME	SA	COST	HSG	TP	RELAY	GD	PUR
MTL	CRANK	CK	PUNCH	WELD	INSP	QC	PO

DESIGN APPROVED
SAMPLE RELEASE
PROD RELEASE JV 4-20-71
SEPIA FROM

DR JTM | ENG JTM V.INT | CKR J.W.D.
DATE 12-3-70 | SC —

MODEL 2 AMP BATTERY FLOAT CHARGER

Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

TEST PROCEDURE 24V

PATT NO.

DWG NO. 539-0164 B

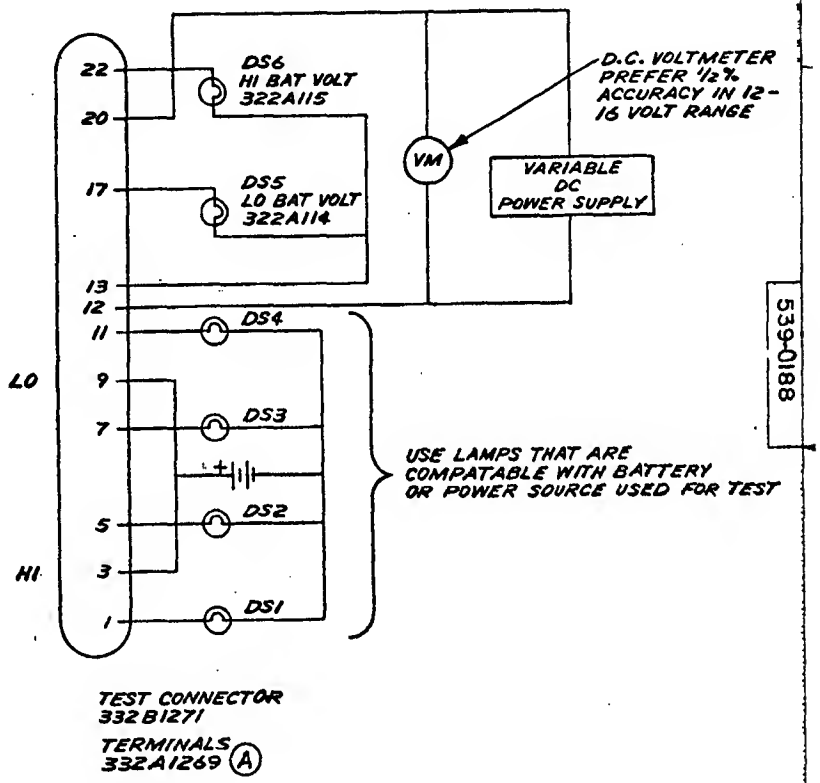
FORM 8C371

5390188

LET	REVISIONS	ZONE	ENG	CKR	DATE
A	WAS # 332A1267	2-8	[illegible]	[illegible]	9-27-73

TEST PROCEDURE

1. PLUG 12V BATTERY VOLTAGE SENSOR 300C796 INTO TEST CONNECTOR.
2. TURN "HIGH" ADJUSTMENT TO MAXIMUM (CLOCKWISE) POSITION AND "LOW" ADJUSTMENT TO MINIMUM (COUNTERCLOCKWISE) POSITION.
3. SET THE DC POWER SUPPLY VOLTAGE TO 12.3 ±.05 VOLTS.
   LAMPS DS2 AND DS4 SHOULD LIGHT.
   LAMPS DS1, DS3, DS5 AND DS6 SHOULD BE DARK.
4. TURN LOW ADJUSTMENT TO THE RIGHT OR CLOCKWISE UNTIL DS5 (LO BAT VOLTS) LAMP LIGHTS.
   LAMPS DS2, DS3 AND DS5 SHOULD LIGHT.
   LAMPS DS1, DS4 AND DS6 SHOULD REMAIN DARK.
5. VARY DC POWER SUPPLY VOLTAGE UP 0.2 VOLT AND DOWN 0.2 VOLT FROM 12.3 VOLTS.
   LAMPS DS3, DS4 AND DS5 SHOULD GO OFF AND ON AS VOLTAGE CHANGES.
6. TURN DC POWER SUPPLY VOLTAGE UP TO 13.7 ±.05 VOLTS.
   LAMPS DS2 AND DS4 SHOULD LIGHT.
   LAMPS DS1, DS3, DS5 AND DS6 REMAIN DARK.
7. TURN LOW ADJUSTMENT CLOCKWISE UNTIL DS5 LAMP LIGHTS.
   LAMPS DS2, DS3 AND DS5 SHOULD LIGHT.
   LAMPS DS1, DS4 AND DS6 REMAIN DARK.
8. TURN HIGH ADJUSTMENT COUNTERCLOCKWISE UNTIL DS6 (HI BAT VOLTS) LAMP LIGHTS.
   LAMPS DS1, DS3, DS5 AND DS6 SHOULD LIGHT.
   LAMPS DS2 AND DS4 SHOULD BE DARK.
9. RAISE DC SUPPLY VOLTAGE TO 15.5 ±.05 VOLTS.
   LAMPS DS1, DS4 AND DS6 SHOULD LIGHT.
   LAMPS DS2, DS3 AND DS5 SHOULD BE DARK.
10. TURN HIGH ADJUSTMENT CLOCKWISE UNTIL DS6 GOES DARK.
    LAMPS DS2 AND DS4 SHOULD LIGHT.
    LAMPS DS1, DS3 DS5 AND DS6 SHOULD BE DARK.
11. VARY DC SUPPLY VOLTAGE UP 0.1 VOLT AND DOWN 0.1 VOLT FROM 15.5 VOLTS.
    LAMPS DS1, DS2 AND DS6 SHOULD GO ON AND OFF WITH VOLTAGE CHANGE.
12. MAKE FINAL FACTORY ADJUSTMENT.
    a) SET HIGH ADJUSTMENT SO DS6 LIGHTS AS DC SUPPLY VOLTAGE IS RAISED TO 14.5 VOLTS AND GOES DARK WHEN LOWERED TO 14.4 VOLTS.
    b) SET LOW BATTERY VOLTAGE SO DS5 LIGHTS AS DC SUPPLY IS LOWERED TO 12.6 VOLTS AND GOES DARK AS VOLTAGE IS RAISED TO 12.8 VOLTS.



TEST CONNECTOR
332B1271

TERMINALS
332A1269 (A)

539-0188

300C796	539C189
NEXT ASSY	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ±
ANGLES... ±
HOLES... ±.006 ±.003
DECIMALS
3 PLACE ±
3 PLACE ±

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539-0188

SEPIA FROM
DR J.W. MORK
CKR W.J.B
ENGR JIM YUIT
SAMP REL
PROD REL JV 4-20-72
PROD REL

ITEM	PART NO.					DWG SIZE	QTY	BULK	DESCRIPTION OR MATERIAL
	MFG Tolley	price	tp	pur	kr mo				DIVISION OF ONAN CORPORATION
	weld	so	hsg	gd	qc				Minneapolis, Minnesota
	sec	punch	crank	ck	kr pu				TEST PROCEDURE
	DATE 6-16-72		BC —						BAT V SENSOR (12V)
									ATSD & ATSE
									539-0188

DWG SIZE C

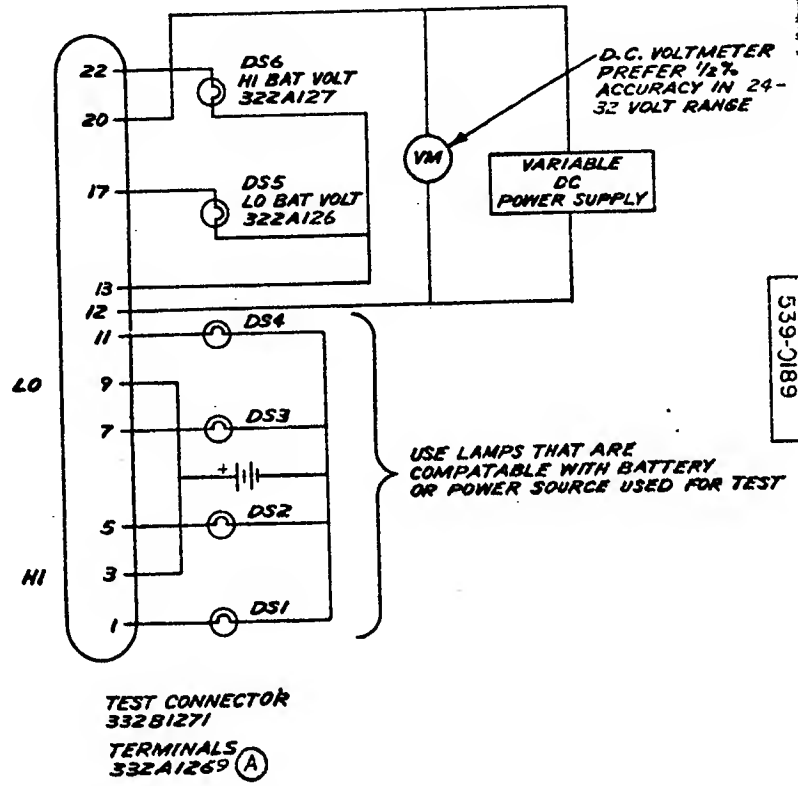
59

539-0189

LET	REVISIONS	BY	CHK	DATE
A	WAS DR 332A1267	Z-B		9-28-72

TEST PROCEDURE

1. PLUG 24V BATTERY VOLTAGE SENSOR 300C797 INTO TEST CONNECTOR.
2. TURN "HIGH" ADJUSTMENT TO MAXIMUM (CLOCKWISE) POSITION AND "LOW" ADJUSTMENT TO MINIMUM (COUNTERCLOCKWISE) POSITION.
3. SET THE DC POWER SUPPLY VOLTAGE TO 24.6 ±0.1 VOLTS.
   LAMPS DS2 AND DS4 SHOULD LIGHT.
   LAMPS DS1, DS3, DS5 AND DS6 SHOULD BE DARK.
4. TURN LOW ADJUSTMENT TO THE RIGHT OR CLOCKWISE UNTIL DS5 (LO BAT VOLTS) LAMP LIGHTS.
   LAMPS DS2, DS3 AND DS5 SHOULD LIGHT.
   LAMPS DS1, DS4 AND DS6 SHOULD REMAIN DARK.
5. VARY DC POWER SUPPLY VOLTAGE UP 0.2 VOLT AND DOWN 0.2 VOLT FROM 24.6 VOLTS.
   LAMPS DS3, DS4 AND DS5 SHOULD GO OFF AND ON AS VOLTAGE CHANGES.
6. TURN DC POWER SUPPLY VOLTAGE UP TO 27.4 ±0.2 VOLTS.
   LAMPS DS2 AND DS4 SHOULD LIGHT.
   LAMPS DS1 DS3 DS5 AND DS6 REMAIN DARK.
7. TURN LOW ADJUSTMENT CLOCKWISE UNTIL DS5 LAMP LIGHTS.
   LAMPS DS2, DS3 AND DS5 SHOULD LIGHT.
   LAMPS DS1, DS4 AND DS6 REMAIN DARK.
8. TURN HIGH ADJUSTMENT COUNTERCLOCKWISE UNTIL DS6 (HI BAT VOLTS) LAMP LIGHTS.
   LAMPS DS1, DS3, DS5 AND DS6 SHOULD LIGHT.
   LAMPS DS2 AND DS4 SHOULD BE DARK.
9. RAISE DC SUPPLY VOLTAGE TO 31 ±0.1 VOLTS.
   LAMPS DS1, DS4 AND DS6 SHOULD LIGHT.
   LAMPS DS2, DS3 AND DS5 SHOULD BE DARK.
10. TURN HIGH ADJUSTMENT CLOCKWISE UNTIL DS6 GOES DARK.
    LAMPS DS2 AND DS4 SHOULD LIGHT.
    LAMPS DS1, DS3 DS5 AND DS6 SHOULD BE DARK.
11. VARY DC SUPPLY VOLTAGE UP 0.1 VOLT AND DOWN 0.1 VOLT FROM 31 VOLTS.
    LAMPS DS1, DS2 AND DS6 SHOULD GO ON AND OFF WITH VOLTAGE CHANGE.
12. MAKE FINAL FACTORY ADJUSTMENT.
    a) SET HIGH ADJUSTMENT SO DS6 LIGHTS AS DC SUPPLY VOLTAGE IS RAISED TO 29 VOLTS, AND GOES DARK WHEN LOWERED TO 28.8 VOLTS.
    b) SET LOW BATTERY VOLTAGE SO DS5 LIGHTS AS DC SUPPLY IS LOWERED TO 25.2 VOLTS AND GOES DARK AS VOLTAGE IS RAISED TO 25.4 VOLTS.

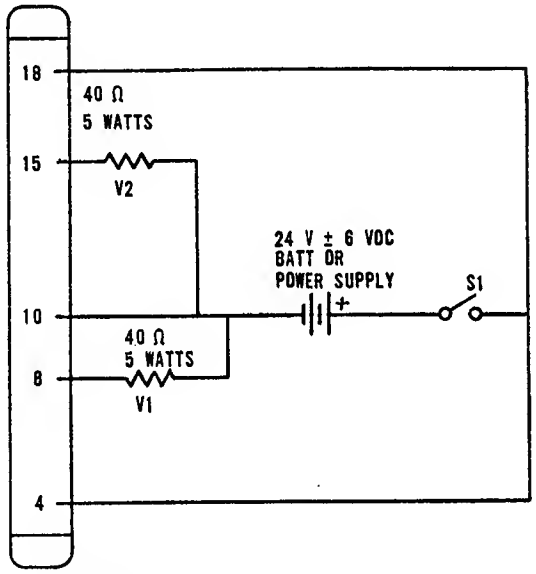


539-0189

300C797 NEXT ASSY	539C188 SIMILAR TO	539-0189	SCALE FROM	ITEM	PART NO.			DWG SIZE	QTY	* BULK	DESCRIPTION OR MATERIAL		
TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONS ± ; ANGLES ...± ; HOLES ....+.006 −.002 ; DECIMALS 2 PLACE ± 3 PLACE ±			DR J. W. MORK								Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota		
			CHK W J B								TEST PROCEDURE BAT V SENSOR (24V)		
			ENGR Jim Vint										
			SAMP REL	DATE 6-16-72									
			PROD REL J V 6-20-72										
			PROG REL	PROG ATSC							PROG 539-0189		DWG SIZE C

539-0194 | DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
A	WAS # 332A1267	A-4	HFM	CP	9-27-73



TEST CONNECTOR
332B1271

Ⓐ TERMINALS
332A1269

NOTES:

1.. PLUG 24VTO 12 V CONV INTO TEST FIXTURE.

2. CLOSE SWITCH S1 TO APPLY 24 V ± 6 VDC.

3. V1 & V2 SHALL BE 13.4 V ± 1 VDC.

NEXT ASSY	SIMILAR TO
TOLERANCES UNLESS OTHERWISE SPECIFIED	
FRACTIONS ±	DECIMALS
ANGLES. . . ±	2 PLACE ±
HOLES. . . . + .006 − .002	3 PLACE ±

539-0194

SEPIA FROM
DR J. MORK
CKR WJB
ENGR
SAMP REL
PROD REL
PROD REL

ITEM	PART NO.					DWG SIZE	QTY	*BULK	DESCRIPTION OR MATERIAL
	95 relay	price	tp	pur	me				DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
	weld	sa	hsg	gd	qc				
	sec	punch	crank	ck	po				TEST PROCEDURE (24V TO 12V CONVERTER)

DATE 7-27-72 sc —

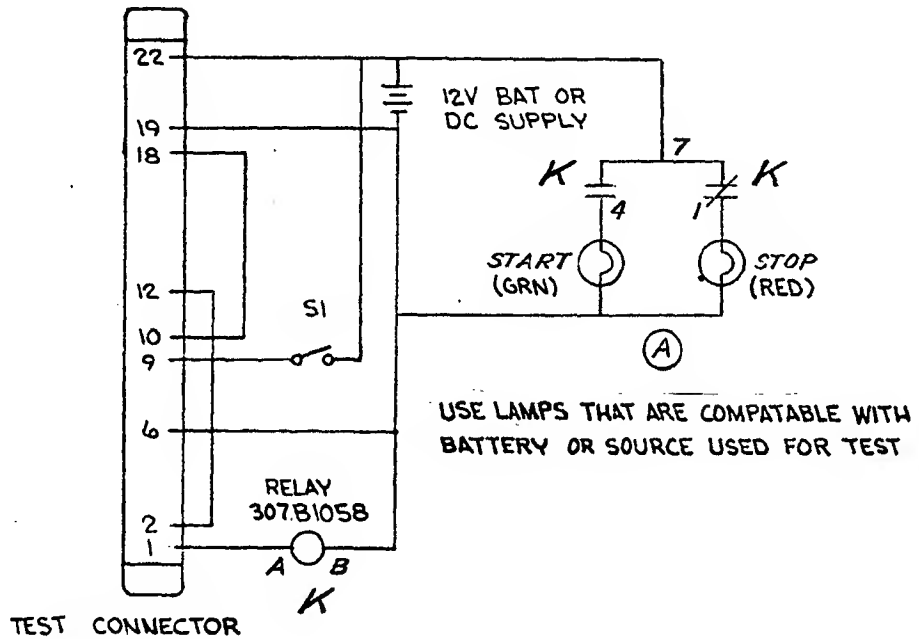
MODEL ATSC, ATSD & ATSE

DWG NO. 539-0194 | DWG SIZE B

FORM 88071

539-0195 | DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
A	ADDED TEST LAMPS	3-C	JV	WJ	7-6-72
B	WAS #332 A 1267	4-A	JTM	CP	9-27-73



NOTES:

1. PLUG 12 V T.D. START-STOP 300C921 INTO TEST FIXTURE.
2. APPLY 12 TO 15 VDC.
3. TURN BOTH START AND STOP ADJ TO MINIMUM (COUNTERCLOCKWISE POSITION).
4. MEASURE MINIMUM TIME DELAY.
   - 4.1 START:
     CLOSE SWITCH S1 AND MEASURE TIME DELAY BETWEEN SWITCH CLOSURE AND RELAY K PICKUP. TIME MUST BE LESS THAN 0.5 SECOND.
   - 4.2 STOP:
     OPEN SWITCH S1 AND MEASURE TIME DELAY BETWEEN THE SWITCH OPENING AND RELAY DROP OUT. TIME MUST BE LESS THAN 0.5 MINUTES.
5. FACTORY SET TIME DELAY;
   - 5.1 START
     TURN START ADJ CLOCKWISE, CLOSE SWITCH S1, AND MEASURE DELAY. TIME MUST EXCEED 15 SECONDS, ADJUST FOR 2.5 ±0.5 SECONDS DELAY.
   - 5.2 STOP
     TURN STOP ADJ CLOCKWISE, OPEN SWITCH S1 AND MEASURE TIME DELAY. TIME MUST EXCEED 5 MINUTES ADJUST FOR 5 ±0.5 MINUTES.

300C921	539B196
NEXT ASSY	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ±
ANGLES...±
HOLES....+.006 −.002
DECIMALS
2 PLACE ±
3 PLACE ±

539-0195

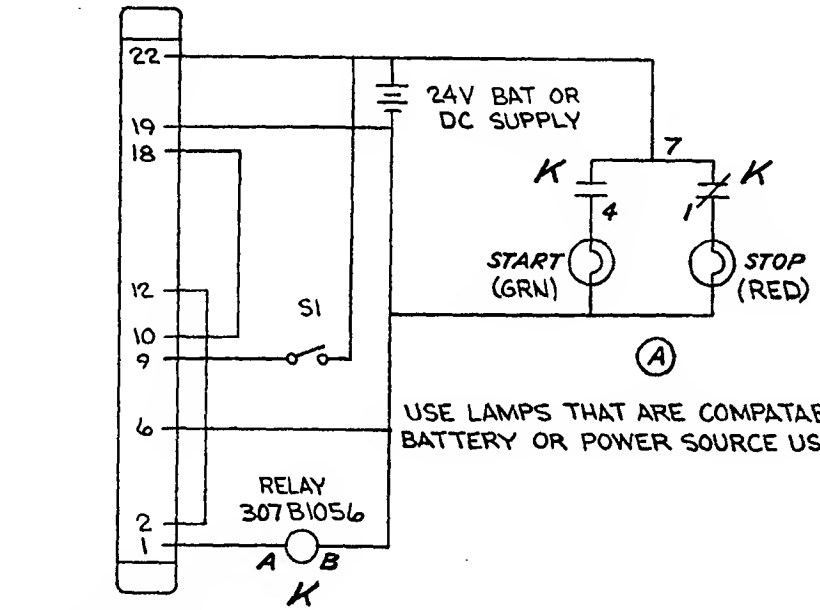
SEPIA FROM
DR JTM
CKR WJB
ENGR JIM VINT
SAMP REL
PROD REL JV 7-14-72
PROD REL

ITEM	PART NO.					DWG SIZE	QTY	* BULK	DESCRIPTION OR MATERIAL
	relay	price	tp	pur	me				DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
	weld	so	hsg	qd	qc				
	sec	punch	crank	ck	po				TEST PROCEDURE 12V (START - STOP)
	DATE 6-13-72			sc —					
MODEL	ATSC, ATSD & ATSE					DWG NO	539-0195		DWG SIZE B

FORM 82871

539-0196 | DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
A	ADDED TEST LAMPS	3-C	JV	WB	7-6-72
B	WAS #332A1267	4-A	HEM	CP	9-27-73



USE LAMPS THAT ARE COMPATABLE WITH BATTERY OR POWER SOURCE USED FOR TEST

TEST CONNECTOR
332B1271
TERMINALS
(B) 332A1269

NOTES:

1. PLUG 24 V T.O. START-STOP 300C922 INTO TEST FIXTURE.
2. APPLY 24 TO 30 VDC.
3. TURN BOTH START AND STOP ADJ TO MINIMUM (COUNTERCLOCKWISE POSITION).
4. MEASURE MINIMUM TIME DELAY.
   - 4.1 START:
     CLOSE SWITCH S1 AND MEASURE TIME DELAY BETWEEN SWITCH CLOSURE AND RELAY K PICKUP. TIME MUST BE LESS THAN 0.5 SECOND.
   - 4.2 STOP:
     OPEN SWITCH S1 AND MEASURE TIME DELAY BETWEEN THE SWITCH OPENING AND RELAY DROP OUT. TIME MUST BE LESS THAN 0.5 MINUTES.
5. FACTORY SET TIME DELAY;
   - 5.1 START
     TURN START ADJ CLOCKWISE, CLOSE SWITCH S1, AND MEASURE DELAY. TIME MUST EXCEED 15 SECONDS, ADJUST FOR 2.5 ±0.5 SECONDS DELAY.
   - 5.2 STOP
     TURN STOP ADJ CLOCKWISE, OPEN SWITCH S1 AND MEASURE TIME DELAY. TIME MUST EXCEED 5 MINUTES ADJUST FOR 5 ±0.5 MINUTES.

300C922	539B195
NEXT ASSY	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED

FRACTIONS ±	DECIMALS
ANGLES. . . ±	2 PLACE ±
HOLES. . . . + .006 − .002	3 PLACE ±

539-0196

SEPIA FROM	
DR	JTM
CKR	WJB
ENGR	JIM VINT
SAMP REL	
PROD REL	JV 7-14-72
PROD REL	

ITEM	PART NO.				DWG SIZE	QTY	*BULK	DESCRIPTION OR MATERIAL
	2 SLT relay	price	tp	pur	me			DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
	weld	sa	hsg	gd	qc			
	sec	punch	crank	ck	po			TEST PROCEDURE 24V (START - STOP)

DATE 6-13-72 SC —

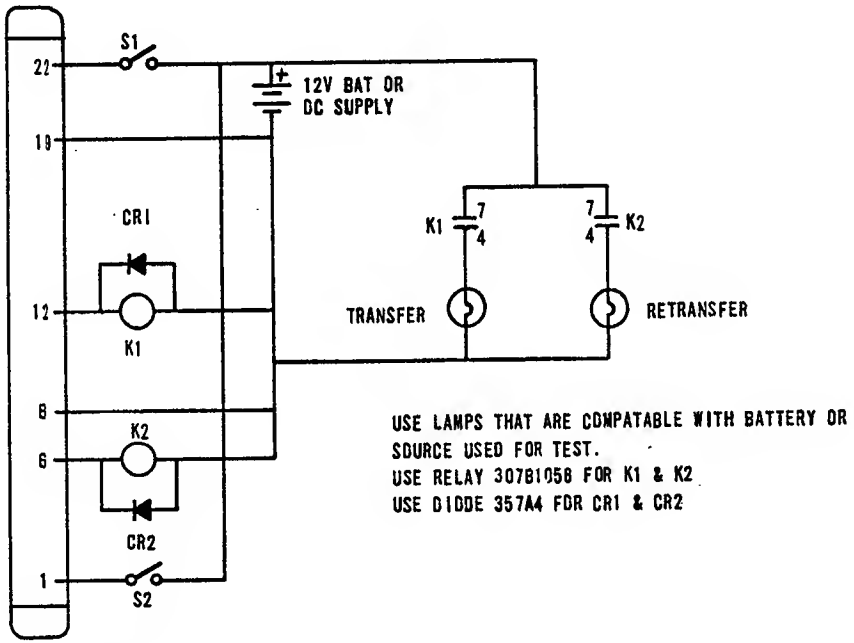
MODEL ATSC, ATSD & ATSE

DWG NO. 539-0196 DWG SIZE B

FORM 88071

539-0199 | DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
A	WAS # 332-1267	A-4	HFM	CP	9-27-73



USE LAMPS THAT ARE COMPATABLE WITH BATTERY OR SOURCE USED FOR TEST.
USE RELAY 30781058 FOR K1 & K2
USE DIODE 357A4 FOR CR1 & CR2

TEST CONNECTOR
332B1271
TERMINALS
(A) 332A1269

NOTES:

1. PLUG 12 V T.D. TRANSFER 300C924 INTO TEST FIXTURE.
2. APPLY 12 TO 15 VDC.
3. TURN TRANSFER ADJ TO MINIMUM (COUNTERCLOCKWISE POSITION).
4. MEASURE MINIMUM TIME DELAY.
   - 4.1 TRANSFER
     CLOSE SWITCH S1 AND MEASURE TIME DELAY BETWEEN SWITCH CLOSURE AND RELAY K1 PICKUP. TIME MUST BE LESS THAN 0.5 SECOND.
5. FACTORY SET TIME DELAY:
   - 5.1 TRANSFER
     TURN TRANSFER ADJ CLOCKWISE. CLOSE SWITCH S1, AND MEASURE DELAY. TIME MUST EXCEED 15 SECONDS. ADJUST FOR 2.5 ±0.5 SECONDS DELAY.

NEXT ASSY	SIMILAR TO
	539-201
	539-200

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ±
ANGLES...±
HOLES....+ .006 − .002
DECIMALS
2 PLACE ±
3 PLACE ±

539-0199

SEPIA FROM	
DR J. MORK	
CKR W.J.B.	
ENGR JIM VINT	
SAMP REL	
PRDO REL JV 7-27-72	
PRDD REL	

ITEM	PART NO.					OWG SIZE	QTY	* BULK	DESCRIPTION OR MATERIAL
	95 relay	price	tp	pur	me				DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
	weld	sa	hsg	gd	qc				
	sec	punch	crank	ck	po				TEST PROCEDURE 12 V (TRANSFER)
DATE 7-27-72				sc —					
MODEL ATSC, ATSD & ATSE						DWG NO. 539-0199			DWG SIZE B

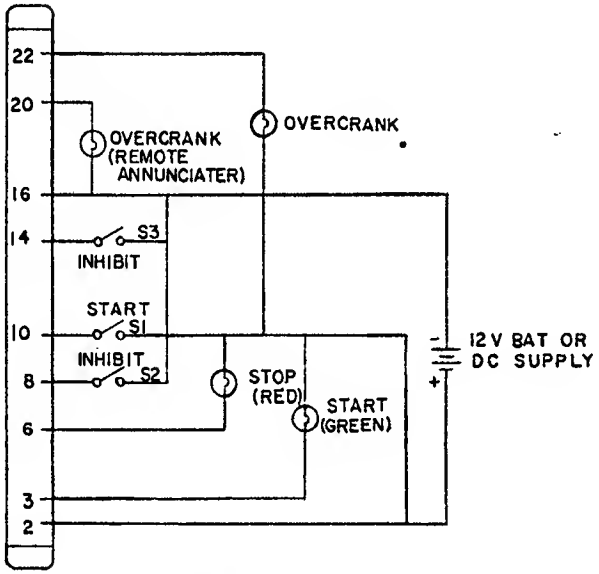
FORM 8E071

64

539-0202

LET	REVISIONS	ZONE	ENG	CHK	DATE
	SUPSD'S DWG SAME NO, "B" SIZE DATED 7-31-72				

TEST CONNECTOR
332B1271
TERMINALS
332A1269



USE LAMPS THAT ARE COMPATABLE WITH BATTERY OR SOURCE USED FOR TEST

NOTES:

1. PLUG 2-3 WIRE CONVERTER 300C0926 INTO TEST FIXTURE.
2. SET SELECTOR SWITCH ON CONVERTER IN NORMAL POSITION, PLACE S1, S2, S3 AND CLOCK SWITCH IN OPEN POSITION.
3. APPLY 12-15 VDC, STOP LIGHT SHOULD GO ON.
4. MEASURE MINIMUM OVERCRANK TIME DELAY (POT R-7, MAX CCW).
   - 4.1 CLOSE CLOCK SWITCH. CLOSE SWITCH S1; STOP LIGHT GOES OFF, START LIGHT GOES ON. AFTER TIME DELAY, START LIGHT OFF AND OVERCRANK LIGHT ON. TIME DELAY MUST BE LESS THAN 5 SEC.
   - 4.2 OPEN SWITCH S1, PUSH RESET SWITCH ON CONVERTER AND OPEN CLOCK SWITCH. (NOTE: OBSERVE RESET ACTION DURING THIS STEP).
5. INHIBIT: SET CRANK TIME FOR 5-10 SEC., CLOSE SWITCH S2 DURING START.
   - 5.1 START LIGHT SHOULD GO OUT WHEN S2 IS CLOSED, AND SHOULD NOT LIGHT AFTER TIME DELAY. OPEN S2.
   - 5.2 REPEAT FOR S3, SAME RESULTS.
   - 5.3 OPEN S1, S2, S3 AND CLOCK SWITCH.
6. HAND CRANK: PLACE SELECTOR SWITCH ON CONVERTER IN HAND CRANK POSITION; BOTH STOP AND START LIGHTS SHOULD BE OFF. CLOSE CLOCK SWITCH, OVERCRANK LIGHT SHOULD NOT COME ON AFTER TIME DELAY.
7. MEASURE MAXIMUM OVERCRANK TIME DELAY. (R-7 MAX CW)
   - 7.1 CLOSE CLOCK SWITCH AND SWITCH S1; STOP LIGHT GOES OFF, START LIGHT GOES ON. START LIGHT GOES OFF AND OVERCRANK LIGHT GOES ON AFTER TIME DELAY. THIS TIME DELAY MUST BE GREATER THAN 150 SEC.
   - 7.2 OPEN SWITCH S1, OPEN CLOCK SWITCH.
8. ADJUST POT R-7 FOR 75 ±5 SEC TIME DELAY. (NOTE: FOLLOW STEP 7.1 BUT ADJUST TO 75 ±5 SEC.)
9. STOP POSITION: PLACE SWITCH ON CONVERTER IN STOP POSITION; STOP LIGHT SHOULD BE ON AND START LIGHT SHOULD BE OFF.
   - 9.1 RETURN SWITCH ON CONVERTER TO NORMAL POSITION, OPEN ALL SWITCHES ON TESTOR, TURN OFF POWER AND REMOVE CIRCUIT BOARD.

539-0202

NEXT ASSY	SIMILAR TO
TOLERANCES UNLESS OTHERWISE SPECIFIED	
FRACTIONS ±	DECIMALS
ANGLES...±	2 PLACE ±
HOLES...+.006 −.002	2 PLACE ±

SEPIA FROM
DR ML
CKR
ENGR
SAMP REL
PROD REL
PROD REL

DATE 10-12-73 sc —

ITEM	PART NO.	DWG SIZE	QTY	* BULK	DESCRIPTION OR MATERIAL
	Assy relay price tp pur inc / weld so hsg gd qc / src punch crank ck po				DIVISION OF ONAN CORPORATION Minneapolis, Minnesota TEST PROCEDURE (2 TO 3 WIRE CONV.

ATSE

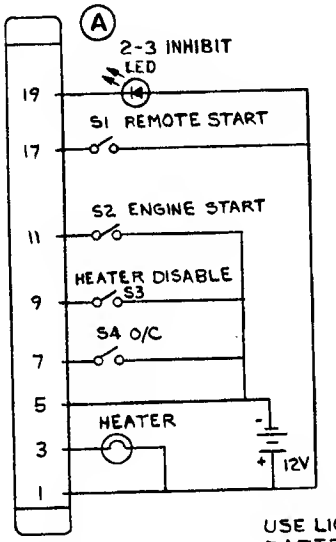
539-0202

539-0202

65

539-0241 | DWG SIZE B

LET	REVISION	ZONE	ENG	CKR	DATE
A	WAS DIFFERENT TYPE LIGHT	4-C		WB	4-11-74



TEST CONNECTOR
332-1271 B
TERMINALS
332-1269 A

USE LIGHTS THAT ARE COMPATABLE WITH BATTERY OR POWER SOURCE USED FOR TEST

NOTES:

1. PLUG TO PREHEAT 300-1072 INTO TEST FIXTURE.
2. APPLY 12-15VDC. NO LIGHTS SHOULD COME ON.
3. SET TIME DELAY. CLOSE S1 2-3 INHIBIT AND HEATER LIGHT SHOULD COME ON. SET ADJ. POT. SO INHIBIT LIGHT GOES OFF 75 ± 5 SECONDS AFTER S1 IS CLOSED.
4. AFTER INHIBIT LIGHT GOES OFF, CLOSE S2. HEATER LIGHT GOES OFF. INHIBIT LIGHT STAYS OFF.
5. OPEN S2, HEATER LIGHT TURNS ON, INHIBIT LIGHT STAYS OFF.
6. CLOSE S3, HEATER LIGHT GOES OFF, INHIBIT STAYS OFF.
7. OPEN S3, HEATER LIGHT TURNS ON, INHIBIT STAYS OFF.
8. CLOSE S4, HEATER LIGHT GOES OFF, INHIBIT STAYS OFF.
9. OPEN S4, HEATER LIGHT AND INHIBIT LIGHT TURN ON.
10. OPEN S1, BOTH LIGHTS GO OFF.

NEXT ASSY	539-0238 B
	SIMILAR TO

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ±
ANGLES . . . ±
HOLES . . . . +.006 −.002
DECIMALS
2 PLACE ±
3 PLACE ±

539-0241

SEPIA FROM
DR GTC
CKR WJB
ENGR
SAMP REL
PROD REL
PROD REL

ITEM	PART NO.	DWG SIZE	QTY	* BULK	DESCRIPTION OR MATERIAL
95	50 relay	me			Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
	price tp pur	qc			
	weld sa hsg	qd			
	sec punch crank	ck			
		po			

DATE 10-18-73 SC

TITLE: TEST PROCEDURE, 12V (TD PREHEAT)

MODEL: ATD & ATE

DWG NO. 539-0241 | DWG SIZE B

FORM 84071

AT'S WITH CONTROL PANEL GROUPS 51 THROUGH 55

To correct the problem, answer the question in the appropriate troubleshooting chart either "YES" or "NO," then refer to the number in the column and proceed to that step. Below is an index of problems.

INDEX

A.	Automatic transfer switch fails to immediately connect load to line when generator set is not operating.	YES	NO
1A.	Is normal line energized and delivering rated voltage to the line terminals of the transfer switch?	2A	—
2A.	Is control panel disconnect plug properly inserted into receptacle?	3A	—
3A.	Does automatic transfer switch have "NORMAL" and "EMERGENCY" indicating lamps?	4A	8A
4A.	Is the green "NORMAL" lamp lit?	5A	8A
5A.	Are contacts K1-CS closed to connect rated voltage across closing coil K1-CC?	7A	6A
6A.	Repair or replace K1-CS contacts.	—	—
7A.	Is closing coil K1-CC open circuited or is there an obstruction preventing transfer switch from closing?	—	—
8A.	Is this a three-phase AT?	9A	12A
9A.	Jumper relay contacts K6 (3-5). Does this correct problem?	10A	12A
10A.	Clean contacts K6 (3-5). Does this correct problem?	—	11A
11A.	Replace relay K6.	—	—
12A.	Does AT have a retransfer time delay K10?	13A	16A
13A.	Jumper relay contacts K4 (5-6). Does this correct problem?	14A	16A
14A.	Clean contacts K4 (5-6). Does this correct problem?	—	15A
15A.	Replace relay K4.	—	—
16A.	Are relay contacts K3 (5-6), contacts K3 (3-4) for 480- and 600-volt system, closed and making good contact?	19A	17A
17A.	Clean contacts K3 (5-6), K3 (3-4) for 480- and 600-volt system. Does this correct problem?	—	18A
18A.	Replace relay K3.	—	—
19A.	Does AT have an auxiliary transfer and retransfer time delay assembly (located in rear of standard cabinet below transfer switch)?	20A	22A
20A.	Does transfer switch operate if terminal TB11-1 is jumpered to TB11-2?	21A	22A
21A.	Repair or replace time delay K11.	—	—
22A.	Is transfer switch mechanically-held on generator side?	23A	27A
23A.	Are generator-side main contacts of transfer switch open?	27A	24A
24A.	Jumper normally-open K2 interlock contacts (in series with K2 tripcoil). Does transfer switch operate?	25A	26A

A.	(Continued)	YES	NO
25A.	Repair or replace normally-open K2 interlock contacts.	—	—
26A.	Is K2 trip coil open-circuited or is trip coil mechanism obstructed?	—	—
27A.	Is rated voltage across closing coil K1-CC?	31A	28A
28A.	Does transfer switch operate if normally-closed K2-IC contacts are jumpered?	29A	30A
29A.	Repair or replace normally-closed K2-IC contacts.	—	—
30A.	Repair or replace cutout switch K1-CS.	—	—
31A.	Closing coil K1-CC is open-circuited or switch mechanism is obstructed preventing transfer switch closure.	—	—

B.	Automatic transfer switch fails to connect load to generator set when set runs during test with load or a normal power outage.	YES	NO
1B.	Is generator output near rated voltage?	2B	—
2B.	Does AT have "NORMAL" and "EMERGENCY" indicating lamps?	3B	4B
3B.	Is "EMERGENCY" lamp lit?	23B	4B
4B.	Does AT have a transfer time delay K13?	5B	8B
5B.	Is time delay completed?	6B	—
6B.	Does transfer switch operate if terminal K13-1 is jumpered to K13-5 (also jumper K13-2 to K13-6 on 480/600-volt AT-E)?	7B	8B
7B.	Repair or replace transfer time delay K13.	—	—
8B.	Is transfer inhibit circuit connected to terminals TB6-11 and -12?	9B	11B
9B.	Does AT transfer load if terminal TB6-11 is jumpered to TB6-12?	10B	11B
10B.	Check for malfunction in inhibit circuit.	—	—
11B.	Does AT have an auxiliary transfer and retransfer time delay assembly (located in rear of standard cabinet below transfer switch)?	12B	14B
12B.	Does transfer switch operate if terminal TB11-5 is jumpered to TB11-6?	13B	14B
13B.	Repair or replace time delay K12.	—	—
14B.	Are contacts K3 (1-3), K3 (5-6) for 480/600-volt systems, closed and making good contact?	16B	15B
15B.	Replace relay K3.	—	—
16B.	Are line-side main contacts of transfer switch open?	20B	17B
17B.	Jumper normally-open K1 interlock contacts (in series with K1 trip coil). Does transfer switch operate?	18B	19B
18B.	Repair or replace normally-open K1 interlock contacts as needed.	—	—
19B.	Is K1 trip coil open-circuited or is trip mechanism obstructed?	—	—
20B.	Is rated voltage across closing coil K2?	26B	21B
21B.	Does transfer switch operate if normally-closed K1-IC contacts are jumpered?	22B	23B
22B.	Repair or replace normally-closed K2-IC contacts.	—	—
23B.	Is transfer switch mechanically-held on generator side?	24B	26B

B.	(Continued)	YES	NO
24B.	Does transfer switch operate if cutout switch K2-CS is jumpered?	25B	26B
25B.	Repair or replace cutout switch K2-CS.	—	—
26B.	Closing coil K1 (CC) is open-circuited or switch mechanism is obstructed preventing transfer switch closure.	—	—

C.	Automatic transfer switch fails to start generator set during a power outage.	YES	NO
	AT-C AND AT-D (Two-Wire Start)		
1C.	Place automatic transfer switch selector switch S2 to "TEST." Does generator set start?	6C	2C
2C.	Is selector switch on engine control in "REMOTE" position?	3C	—
3C.	Does generator set start, run and stop with switch located on engine control? Return switch to remote position.	4C	—
4C.	Jumper TB1-B+ to TB1-RMT. Check to ensure that voltage from GND to TB1-RMT is equal to battery rated voltage. Does engine crank?	5C	—
5C.	Check circuit from TB1-B+ through AT switch S2 (1-2) to TB1-RMT for loose connections or open circuit.	—	—
6C.	Does AT have a start time delay K7?	7C	8C
7C.	Has time delay K7 completed its delay?	8C	—
8C.	Does generator set start if terminal K7-1 is jumpered to K7-5?	9C	—
9C.	Replace relay K7.	—	—
	AT-E (Three-Wire Start)		
1C.	Place automatic transfer switch selector switch S2 to "TEST." Does generator set start?	12C	2C
2C.	Has an engine overcrank occurred? Check overcrank button on AT control accessory panel.	3C	4C
3C.	See generator set manual.	—	—
4C.	Jumper terminal K5-1 to K5-2. Does generator set start and run?	5C	6C
5C.	Replace cranking limiter assembly.	—	—
6C.	Does AT have a preheat time delay for a diesel generator set?	7C	10C
7C.	Has preheat time delay completed its delay?	8C	—
8C.	Does generator set start and run if terminal TB1-H is jumpered to TB1-3?	9C	10C
9C.	Check preheat time delay circuit for an open and replace time delay if necessary.	—	—
10C.	Jumper contacts K4 (1-2). Does engine crank?	11C	—
11C.	Replace relay K4.	—	—
12C.	Move selector switch back to "NORMAL." Does AT have automatic exercise clock?	13C	15C

C.	(Continued)	YES	NO
13C	Does generator start and run if exerciser contact M1-4 is jumpered to M1-5?	14C	15C
14C.	Replace the microswitch on the exerciser clock or replace exerciser clock.	—	—
15C.	Does AT have a start time delay relay K7?	16C	17C
16C.	Has time delay K7 completed its delay?	17C	—
17C.	Does generator set start if terminal K7-1 is jumpered to K7-5?	18C	—
18C.	Replace relay K7.	—	—

D.	**Automatic transfer switch fails to automatically retransfer load from generator set to line after normal power returns. Generator set continues to run.**	YES	NO
1D.	Is control panel disconnect plug inserted completely into receptacle?	2D	—
2D.	Is test transfer switch S1 in closed ("NORMAL") position?	3D	—
3D.	Is rated AC voltage present at transfer switch line terminals?	4D	—
4D.	Does automatic transfer switch have area protection equipment connected to terminals TB1-4 and TB1-5?	5D	7D
5D.	Jumper terminals TB1-4 to TB1-5. Does automatic transfer switch retransfer load to line (at end of retransfer time delay if used)?	6D	7D
6D.	Check area protection equipment for malfunction.	—	—
7D.	Is automatic transfer switch a 3-phase AT?	8D	10D
8D.	Is rated AC voltage (nominal 220 with 480- or 600-volt system) present between terminals K10-6 and K10-8?	10D	9D
9D.	Replace phase protection relay K6.	—	—
10D.	Does AT have a retransfer time delay relay K10?	11D	13A
11D.	Has motor timer completed time delay period? Time delay expired if AC voltage is present between terminals K10-6 and K10-7.	16A	12D
12D.	Replace motor timer if it is stalled (does not time out).	—	—

E.	Automatic transfer switch delays transferring load to line until generator set stops after a power outage.	YES	NO
1E.	Does AT have a retransfer time delay K10?	2E	5E
2E.	Has time delay completed delay period? Time delay expired if AC voltage present between terminals K10-6 and K10-7 (with generator set running—K4 energized).	3E	—
3E.	Does transfer switch retransfer load to line if terminal K10-8 is jumpered to K10-7?	4E	5E
4E.	Repair or replace retransfer time delay K10.	—	—
5E.	Do relay contacts K3 (5-6), contacts K3 (3-4) for 480/600-volt system, close when the normal source voltage returns?	6E	7E
6E.	Clean K3 contacts. Does this correct problem?	—	7E
7E.	Replace relay K3.	—	—

F.	Generator set starts during normal power service.	YES	NO
1F.	Is operation selector switch S1 positioned at "NORMAL?"	2F	—
2F.	Is control panel disconnect plug inserted completely into receptacle?	3F	—
3F.	Does automatic transfer switch have an exerciser clock?	4F	5F
4F.	Is exerciser clock turned to exercise period?	—	5F
5F.	Is rated AC voltage present at transfer switch line terminals?	6F	—
6F.	Is automatic transfer switch a 3-phase AT?	7F	9F
7F.	Is phase protection relay K6 energized and are contacts K6 (3-5) closed and making good contact?	9F	8F
8F.	Replace phase protection relay K6.	—	—
9F.	Does AT have a start time delay K7?	10F	11F
10F.	Measure for rated AC voltage (nominal 220 with 480- or 600-volt system) from terminal K7-L1 to K7-L2. If present, repair or replace start time delay relay K7.	—	—
11F.	Is start-stop relay K7 energized and are contacts K7 (1-5) open?	—	12F
12F.	Replace start-stop relay K7.	—	—

G.	Exerciser clock does not start generator set.	YES	NO
1G.	Does exerciser motor timer M1 operate?	2G	15G
2G.	Is operation selector switch S2 at "NORMAL?"	3G	—
3G.	Has overcrank condition occurred?	—	4G
4G.	Does generator set have two-wire starting?	5G	6G
5G.	Are contacts M1 (3-5) closed and making good contact to put battery voltage on TB1-RMT terminal during exerciser period? See instructions for exercise clock adjustments.	—	16G
6G.	Are contacts M1 (4-5) open and M1 (3-5) closed during exercise period? See instructions for exercise clock adjustments.	7G	16G
7G.	Jumper terminal K5-1 to K5-2. Does generator set start and run?	8G	9G
8G.	Replace cranking limiter assembly.	—	—
9G.	Does AT have a preheat time delay for a diesel generator set?	10G	13G
10G.	Has preheat time delay completed its delay?	11G	—
11G.	Does generator set start and run if terminal TB1-H is jumpered to TB1-3?	12G	13G
12G.	Check preheat time delay circuit for an open and replace time delay if necessary.	—	—
13G.	Jumper contacts K4 (1-2). Does engine crank?	14G	—
14G.	Replace relay K4.	—	—
15G.	Replace the exerciser clock.	—	—
16G.	Replace the microswitch on the exerciser clock or replace exerciser clock.	—	—

MOTOR TIMER RETRANSFER TIME DELAY

The motor timer operates on AC voltage and delays retransfer of the load from the generator set to the line. A stepdown transformer T1 supplies 120 volts AC to the motor timer in all automatic transfer switches (see drawing 626D0145).

When the normal line voltage fails, the voltage sensors drop out line interposing relay K3 and timer relay K5. The voltage sensors sense restoration of normal line voltage and close the circuit from ground to relays K3 and K5. Relay contacts K5 (5-8) close to apply AC from T1-X4 and -X5 to the motor timer A11 (2-7). At the end of the time delay period, contacts A11 (6-8) close the circuit to pick up relay K3. Relay contacts K3 (2-8) open and contacts K3 (9-6) close to transfer the load from the generator set to the normal line.

PREHEAT TIME DELAY

When a power outage occurs, TB1 - B+ feeds battery positive to the 2 to 3 wire converter plug-in module 9 (1-2) and to preheat time delay plug-in module 16 terminal 1 (drawing 626D0145). Terminal 16 of the 2 to 3 wire converter module 9 supplies ground to terminal 5 of preheat time delay module 16. Output terminal 3 grounds terminal TB1-H to energize the preheat solenoid on the generator set. Time delay plug-in module 16 terminal 19 applies ground to the 2 to 3 wire converter module 9 terminal 14 to inhibit the crank cycle during the preheat period.

After the preheat period, module 16 (terminal 19) removes the ground from the crank inhibit terminal 14 of the 2 to 3 wire converter module 9. The 2 to 3 wire converter module relay closes a set of contacts and applies ground from terminal 4 to TB1-3. The generator set starts and runs.

Output voltage to transfer switch K2 (drawing 626C0106) terminals A and B through TB7-6 and -7, TB6-6 and -7 (drawing 626D0145) energizes the primary of stepdown transformer T3. Transformer T3 terminals X1 and X2 feed a nominal 40 volts into undervoltage sensor module 4, terminals 12 and 15. When output voltage exceeds the set point of voltage sensor 4, the solid state switch (8-10) closes to complete the circuit to the 2 to 3 wire converter module 9 terminals 8 and 9. A relay on module 9 opens its contacts, removing the ground to TB1-3 to stop cranking (start disconnect circuit). The voltage sensor module 4 also completes the ground to terminal 9 of the preheat time delay module 16 to open the preheat circuit to the generator set.

PUSH TO RETRANSFER AND SELECTOR SWITCHES

Some automatic transfer switch installations require that the generator set continue to supply power until a retransfer signal is manually initiated after restoration of normal power. Some installations also require a selector switch for choice of automatic retransfer or manually initiated retransfer through a push-to-retransfer switch. Drawing 626D0145 shows both the selector switch S3 and push-to-retransfer switch S4.

Manual Retransfer

With S3 selector switch in "MANUAL" position, relays K3 and K5 drop out on a voltage dip or a commercial power outage. If the normal line restores voltage before the generator set can build up voltage, normally closed contacts K4 (2-8) will reenergize relay K3 to keep the load on the line.

If normal line power stays off, the voltage sensor module 4 energizes relay K4 through bypass module 8 contacts (12-22). Relay contacts K4 (2-8) open and contacts K5 (4-7) remain open to prevent K3 from picking up when the undervoltage sensor modules 1, 2 and 3 close the circuit on normal power restoration.

To initiate a retransfer when line power returns, the operator must push retransfer switch S4 bypassing contacts K5 (6-9) to energize relay K5 through the voltage sensors. Contacts K5 (6-9) close to "seal in" relay K5, and contacts K5-4 and -7 close to energize relay K3 through automatic-manual switch contacts S3 (2-3) and voltage sensor modules 1, 2 and 3. Relay contacts K3 (2-8) open and contacts K3 (6-9) close to transfer the load from the generator set to the normal line. See *Restoration of Normal Line*. Contacts K3 (1-7) open to initiate the time delay in stop.

Automatic Position

With automatic-manual transfer selector switch S3 in the "AUTOMATIC" position, relay K5 will pick up on normal power restoration through switch contacts S3 (1-2), and voltage sensor modules 1, 2 and 3. Relay contacts K5 (5-8) close the circuit from terminals X4 and X5 of stepdown transformer T1 to the motor circuit A11 (2-7). The motor timer times out and closes contacts A11 (6-8) to energize relay K3 through contacts S3 (1-2), A11 (6-8), and voltage sensor modules 1, 2 and 3. Relay K3 picks up to open K3 (2-8) and close K3 (6-9) to transfer the load from the generator set to the normal line. See *Restoration of Normal Line*. K3 (1-7) open to initiate the time delay stop.

NORMAL AND EMERGENCY LAMPS

The green normal and the red emergency lamps indicate which source is supplying power to the load. During normal operation, the line supplies power from line A (drawing 626C0106) through TB7-11 (drawing 626C0164) to transformer T11 primary, back through TB7-10 (drawing 626C0106), through K2 contact IC, J1-W which connects to P1-W (drawing 626D0145). The circuit is completed through either contacts K3 (6-9) or K4 (3-9), back through P1-Y, J1-Y